

FIRST TERM
SCHEME OF WORK

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WEEK 1

ADAPTATION FOR SURVIVAL

Adaptation is a process by which an organism becomes fitted to its environment, thereby enabling it to live successfully and reproduce. The organism possesses features or structure which improves the chances of survival in its environment.

In other words, adaptation is the ability of an organism to live successfully in a particular habitat as a result of its structural, physiological and behavioural features.

Organisms undergo adaptation when their environment changes in some way or if they migrate to a new environment. The features which enable organisms to live well in a habitat are called adaptive features.

COMPETITION

Competition is defined as the process by which living organisms in a habitat struggle or competes with one another to obtain limited essential resources in the environment. Such important resources include food, water, light, nutrients, mates, shelter and space.

Competition is much notice when environmental resources needed for the organism survival are very limited. During competition few organisms which are well adapted control the scarce resources which enable them to grow and survive while leading to their elimination from the environment.

TYPES OF COMPETITION

In organisms competition occurs at two levels.

- (i) **INTERSPECIFIC COMPETITION:** This is also known as inter-species competition. Here competition exists between individuals of different species e.g Mango plants and grasses; Herd of cattle and herd of antelopes on a grazing land.
- (ii) **INTRA-SPECIFIC COMPETITION:** This is also known as intra-species competition. Here, competition exists between individuals of the same species or kind e.g Maize seedlings in a nursery, a flock of domestic fowls in a deep little house.

RELATIONSHIP BETWEEN COMPETITION AND SUCCESSION

Competition plays a key role in succession. In a succession, habitats which are newly formed are gradually colonized by different plant species step by step until a relationship stable community is established and later the habitat will be inhabited by animals.

Succession is the change in a population caused by the replacement of old members or the addition of the new ones as a result of competition.

As soon as a habitat is established competition sets in. Competition plays a part in determining the patterns in which species succeed one another in a habitat. In a habitat, plants and animals which make up the community undergo a series of changes with time. This process of change can be seen if an abandoned farmland is observed for several years. The species which first colonized the habitat would normally give way to other species as a result of competition. The process continues until a stable community is established.

ADAPTATION FOR SURVIVAL

STRUCTURAL ADAPTATION

In any habitat, it is possible to observe the special adaptations of the organisms in it, which enable them to live there successfully and reproduce such adaptations, are grouped into:

1. Structural adaptations
2. Adaptive Colouration
3. Behavioural Adaptations

STRUCTURAL ADAPTATIONS

Structural adaptations are special modifications of the body of living organisms which help the organisms to survive better in their various environments. There are structural adaptations for the following specific functions:

1. Obtaining food
2. Escape and defence
3. Securing mates
4. Regulations of body temperature
5. Conservation of water

OBTAINING FOOD

Animals have to take in ready-made food from their surroundings. They may be plant feeders or animal-feeders. These animals use their mouths and hands or feet for feeding. Birds and insects are two examples of animal groups that show a variety of specialization feeding adaptations within their groups.

Birds use their beaks and feet to catch, grip and tear or crush food before swallowing it.

Insects have mouth parts modified for various ways of feeding. In some insects, the legs are modified for catching and grasping prey.

The toad has a long sticking tongue which it flicks out swiftly to catch insects. The insects stick to the tongue and it is then withdrawn into the mouth.

Insectivorous plants have adaptations for trapping insects which they digest to obtain nitrogenous food material.

Assignment

In a tabular form, write the adaptation of the beaks and feet of birds for obtaining food pg 520

ESCAPE AND DEFENCE

Most animals are either predators or prey. Preys escape predators through the following categories of adaptation:

- (a) Escape and adaptation

(b) Defence Adaptation

Escape adaptations include camouflage, individual responses and group responses.

CONCEALING COLOURATION

It is an important camouflage mechanism used to escape detection by potential predators.

Defence adaptations include physical defences, mimicry and chemical defences.

Physical defences are usually structures like armours and spines that protect the animal from direct attacks by predators e.g. shell of tortoise, spines of the hedgehog, horny armour of the scaly anteater.

WARNING COLOURATION

It is also a physical defence adaptation in which a species may mimic an uninteresting object or a species that predators normally avoid (because it possesses an unpleasant or harmful feature like a foul smell or taste or a poisonous sting).

Chemical defence is common among both animals and plants. The chemicals are usually poisons that can stun, kill or cause pain. Animals use stings, fangs and biting mouth to inject the poisons directly into the predator's body.

SECURING MATES

Sexually reproducing animals have various adaptations that help them to recognize and attract compatible mates. Sexual selection generally favours a dull appearance for the female and an attractive one for the male.

The fittest males are the ones that are sufficiently attractive to secure mates.

REGULATION OF BODY TEMPERATURE

Mammals and birds maintain a constant body temperature, structural features that are involved in regulating heat loss from the body include:

- Hair (fur) in mammals and feathers in birds
- Layer of fat under the skin
- Body size and shape
- Pinna (external ear) and the sole of feet

CONSERVATION OF WATER

Some plants and animals have adaptive features which enable them to conserve water.

ADAPTIVE COLOURATION

Adaptive colouration is the possession of colours by an organism which enables it to catch its prey, avoid its predators or enemies and ensure its survival. Such adaptive colouration is due to the presence of pigments in cells.

Assignment

In a tabular form, write the common pigments responsible for colouration in plants and animals. pg 523

Adaptive colouration may be grouped into:

1. Concealing colouration
2. Warning colouration
3. Mimicry

CONCEALING COLOURATION

This is also known as cryptic colouration. It is used in camouflage. Colouration that helps an animal to escape predation is also known as protective colouration e.g. Grasshopper and grass.

DISRUPTIVE COLOURATION

Some animals have patterns on their body surfaces. These patterns enable them to be undetected. This is known as disruptive colouration e.g. the spots and stripes of the leopard, giraffe, zebra, tiger etc.

COUNTER SHADING: Many animals have dark-coloured dorsal surfaces and light-coloured ventral surfaces. This is known as counter-shading. It helps the animals to remain undetected e.g. Fish cannot be noticed when viewed from the top by a predatory bird because its dark dorsal (back) surface blends with the dark waters. It cannot be seen from below the water by a predatory fish because its light ventral surface merges with the light falling from above.

COLOUR CHANGE

This is the ability of some organisms to change the colour of their body to look like that of the environment. For example, the chameleon can change its body colour in seconds to look like the environment. The grasshoppers can also change their colours from green in the rainy season when the grasses are green to brown in the dry season when the grasses are brown. These colour changes in the body prevent the animal from being noticed by predators.

A special pigment cells called chromatophores on their body surfaces are involved in colouration and colour changes.

WEEK 2

BEHAVIOURAL ADAPTATION AND SOCIAL ANIMALS

Behaviour is everything an organism does in response to changes in its environment.

Behavioural adaptation is generally associated with animals, since most behavior patterns involve movements of various body parts and locomotion.

However, behavioural adaptations can be seen in:

- (i) Phototropic movements of plants shoot.
- (ii) Insects –trapping movements of the leaves of venus flytrap.
- (iii) Coiling response of the leaf tendrils of the Gloriosa plant when they touch a support.

BEHAVIOUR OF INDIVIDUAL ANIMALS

Animals exhibit a variety of behavioural patterns with respect to obtaining food, escape and defence, surviving unfavourable conditions, communication, finding mates and caring for the young.

OBTAINING FOOD: This is one of the basic ways animals get food. These behaviors are known as foraging behavior.

For examples;

- A chameleon sits calm and flicks out its tongue to catch unsuspecting flying insect.
- An ant-lion digs a funnel-shaped pit and lie partly buried at its bottom to catch and feed on the ants that fall into the pit.
- The spider spins a web and waits for the prey to be caught in it.

ESCAPE AND DEFENCE

Animals also to escape being eaten, some of these behaviours SCALE OFF the predators, startle, confuse or distract them temporarily, thereby enabling the potential to escape.

Assignment

In a tabular form, write the behavior adaptations for the following

- *Obtaining food*
- *Escape and defence*
- *Communication*
- *Examples of signals used in courtship.*

SURVIVING UNFAVOURABLE CONDITIONS

Many animals survive unfavourable environmental conditions such as low or high temperatures and shortage of food or water. These behaviours include: hibernation, aestivation and migration.

HIBERNATION: This is a dormant sleep – like state which some animals experience over the winter while living off the reserved body fat, with or decrease in body temperature and pulse rate and slower metabolism. Animals that hibernate include bears, bats and many amphibians.

AESINATION: Some animals spend the hot dry seasons in a deep-like, dormant state. Examples of such animals include the African lungfish, insect, snakes, toad and rodents.

MIGRATION: These are long journeys movement that animals make from one place to another. Seasonal migrations follow definite routes.

COMMUNICATION: Animals exhibit various behaviours that enable them to communicate with other members of their species or community.

FINDING MATES: The animals kingdom have numerous examples of highly specialized courtship behaviours to find mates.

CARING FOR THE YOUNG: Parental care is exhibited mainly by birds, mammals and social insects. Such care includes protecting and incubating eggs looking after the larval forms (in insects) and looking after the helpless young animals after they hatch or are born.

FOR EXAMPLE

- The male sea horse carries the eggs in his pouch until they hatch.
- A female scorpion carries her young on her back until they moult for the first time.
- A mother hen utters warning cries when she sees a hawk and spreads out her wings for the chicks to shelter.

SOCIAL ANIMALS

Social animals are the animals of the same species that live together cooperatively in organized communities known as societies or colonies.

A colony is a group of individuals belonging to the same species and organized in a cooperative manner. Examples of social animals are: Termites, Bees or Wasps, Ants, Wolves, Foxes and Baboons.

BEHAVIOUR OF SOCIAL ANIMALS

In most vertebrates and many insect species, individuals come together to form temporary or permanent groups, where they interact directly with one another. The group activities they show are known as social behavior.

The efficiency of the society is increased by giving individuals specific roles and places within the society. In vertebrate societies, this leads to social hierarchy known as peck order. Insect societies have caste system.

Pecking order is a social hierarchy in which some members of a group are established as superior to others. It ensures that the most powerful or fittest individual has the highest rank, the rest are arranged in a descending order according to their degree of fitness.

ADVANTAGES OF SOCIAL GROUPS

1. It protects them from predators.
2. It helps them to obtain food.
3. It helps them to find mates.
4. It helps or inhibits their growth and metabolism and restricts their population size.
5. It facilitates learning. This is an important factor in survival.

6. It reduces aggression and competition among members of the society. This is because when essential resources become scarce, pecking order comes to play. The fittest will survive and the weakest perish.

INSECT SOCIETIES

Bees, wasps, termites and ants are social insects that live in societies that are based on a caste system. Each caste performs a special task or series of tasks. In the insect caste systems, the individuals place in the society is already determined when its life begins. As a result, competition within the society is removed. Reproductive activity (which always causes the most conflict is centred around a single female.

Social insects are differentiated in structured function and behavior. The major ones being the reproductive (e.g the queen) and the steriles (workers and soldiers). Besides carrying out the basic function of reproduction, the members of the reproductive caste generally select the site for a new colony and excavate the first galleries (under-ground passage). The workers care for the eggs and larvae, collect food for other members of the colony, and construct and repair the nest, while the soldiers defend the colony against predators.

CHARACTERISTICS / FEATURES OF SOCIAL INSECTS

- They live together in colonies.
- They show or display division of labour.
- They show distinct castes.
- Members communicate with one another within the colonies.

TERMITE

A termite colony is a highly specialized insect society. They are commonly known as white ants. They are saprophytes that feed on wood and dead plants materials. Termites are usually found living in dead woods or decaying leg of wood chambers under the ground or anthills (termitarium).

Termites have three main castes, which are:

- The soldiers
- The workers
- The reproductives. These are divided into: (i) King
(ii) Queen
(iii) Winged reproductives

Assignment

1. *In a tabular form, write the featuring and functions of the various castes of (i) Termites (ii) Honey bees.*
2. *Itemize the economic importance of (i) Termites (ii) Honey bees.*

LIFE HISTORY OF THE TERMITE

The termite exhibits incomplete metamorphosis.

Egg → Nymph → Adult

The king fertilizes the queen that lays numerous eggs. The workers take care of the eggs till they hatch into young termites called nymphs. The nymphs develop into soldiers or reproductives. The nymphs which fail to develop become the workers.

At the onset of a rainy season the matured winged reproductives fly off from the nest in large numbers this is called swarming. During this flight (also known as the nuptial wedding flight), pairs of male and female termites isolate themselves from the others and fall to the ground. Their wings then break off and each pair goes its own way to form a nest in a suitable spot. They begin to make a few tunnels in the ground.

Inside the tunnel, the male reproductive is the potential king and the female, the potential queen. Mating occurs in about a week's time. Soon the female lays eggs and becomes the queen of the new colony while the male becomes the king. The laid eggs later hatch into winged reproductives, soldiers and workers.

HONEY BEES

Honey-bee society or colony lives in a hive. The hive is made up of chambers. Each chamber is called a cell. There are three castes in a bee colony.

- These are:
- (i) Drone
 - (ii) Queen
 - (iii) Worker

LIFE HISTORY OF HONEY BEE

Bees undergo complete metamorphosis. The drone hatches from an unfertilized egg. The queen and the workers hatch from a fertilized egg. If a larva is fed on pollen and honey it becomes a worker; if it is fed on royal jelly (a protein-rich substance that worker bees secrete) it becomes a queen. This is an example of how chemicals play a role in the organization of an insect society. The queen substance (phenomene) that suppresses the development of the ovaries in the workers.

When a colony becomes too large, the workers make a few queen cells in which potential new queens develop. The old queen flies off with several thousand workers to establish a new colony. This is called swarming.

VERTEBRATE SOCIETIES

Vertebrate societies are different from insect societies in the following ways:

- (i) All members of a vertebrate society are able to reproduce.
- (ii) Except for sexual differences, members of a vertebrate society are alive.
- (iii) In a highly organized vertebrate society an individual's place is not predetermined at birth. Each member must compete with the others for its place in the society.

To live in a vertebrate society, an individual must be aggressive. Aggressive must be controlled to prevent the group from breaking up. Aggressiveness is controlled by

- (i) Establishing a dominance hierarchy such as peck order.
- (ii) Territoriality.

Territoriality allows spacing among individuals according to the available resources. Here, there is no social rank every male with a territory is an effective reproducer. Fighting rarely occur over established territories, invaders are often chased away by a show of aggressive behaviour.

NERVOUS COORDINATION

Coordination is the harmonization of the actions of different parts of the body of an organism so that they work together to achieve the organism's objectives. In vertebrates, coordination is achieved through the functioning of two systems.

- (i) The endocrine system
- (ii) The nervous system

Both systems work together to coordinate the activities in the body. The important links between these two systems is the hypothalamus.

Differences between Nervous and Endocrine Coordination

NERVOUS SYSTEM

- * Messages are passed mainly as electrical impulses along nerves.
- * Response is fast.
- * Effect is for a very short time.
- * It is mainly controlled by brain and spinal cord.
- * Effectors (muscles and glands) receive the message.
- * Transmissions are via nerve fibres and are very rapid.
- * Effects are usually localized and temporary.

ENDOCRINE SYSTEM

- Messages (information are chemical substances through blood stream.
- Response is slow.
- Effect is for a long time.
- It is controlled by endocrine message.
- Target organs receive the message
- Circulatory system and is comparatively slow.
- Effects may by wide spread.

NERVOUS SYSTEM

The nervous system consists of brain spinal cord and nerves. Stimuli is received processed, responds and co-ordinates the activities of the body. The nervous system is divided into two parts namely:

Central nervous system
Peripheral nervous system

THE CENTRAL NERVOUS SYSTEM

The central nervous system consists of the brain enclosed in the Cranium (brain box) and spinal cord which runs down the centre of the vertebral column (back).

THE BRAIN

The brain is the most specialized organ of the human body weighing about 1.4kg. It is composed of millions of nerve cells called neurons. Three connective tissue membranes.

1. Dura mater (outer membrane)
2. Arachnoid mater (middle membrane)
3. Pia mater (inner membrane)

The duramater is strong, thick and is protective in function.

The arachnoid mater is made up of elastic and fibrous tissues. It is between pia mater and duramater.

The pia mater is a delicate membrane well supplied with blood vessels that carry food and oxygen to the cells of the brain. Between the pia mater and the dura mater is a space filled with – extracellular fluid called cerebrospinal fluid.

- Fluid protects the CNS against mechanical injury and shock.
- It maintains a constant pressure inside the skull inspite of fluctuations in the volume and pressure of blood in the cranial vessels as well as nutrients and was exchange between it and the nerve cells.

NOTE: Inflammation of the meninges is called MENINGITIS.

The brain is divided into three portions namely:

- Fore brain
- Mid brain
- Hind brain

THE BRAIN

The brain is protected from all side by the skull which is the strongest bones in the animals body. The brain is the organ that enables the animal to control its internal environment and to respond suitably to its external environment. It does this by correctly the interpreting. Co-ordinating and responding to all the impulses sent to it by all sensory cells and organs in the body. The brain is the center of memory, emotion, thought and intelligence.

The largest part of the brain is made up of two cerebral hemispheres the right hemisphere which controls the left of the body and left hemisphere which controls the right half of the body. These situations are because the spinal nerves cross over from the right to the left-hand side of the brain and from the left to the right hand sides of the brain. 12 pairs of cranial nerves also control the brain of varies part of the body.

FORE BRAIN

It consists of the olfactory lobes; cerebrum (Cerebral hemisphere, Thalamus, Hypothalamus).

OLFACTORY LOBES

They are two small structures placed.

FUNCTION

1. They receive sensory impulses from the olfactory organ.
2. They are concerned with smell which make the animal aware of odour in its environment.

CEREBRUM

It is the largest and most dominant part of the brain. It occupies the upper portion of the brain box (cranium) it is divided into two halves of hemispheres by a median fissure. The two halves are connected by a band of fibres and nerves called corpus callosum.

The outer surface of the cerebrum is the cortex. The cortex consists of grey matter because it is made up of the grey cell bodies of neurons. The inner part of the cerebrum is made up of mass of nerve fibres (axons) known as white matter.

FUNCTIONS

1. It is the centre of seat of consciousness, intelligence, memory, judgment, reasoning, speech-making, learning interpreter or sensation imagination and creativity.
2. It is the centre of all voluntary actions in the body.
3. It collects information from sense organs and stores such information (e.g learning and behavior) for later use.

THALAMUS

It is located above the midbrain and contains grey matter. It is regarded as the gatekeeper of cerebrum. All the sensory impulses received by the brain must pass through the thalamus.

FUNCTIONS

1. It is the centre for sensation, touch pain and anger.
2. Directs sensory impulses from the lower parts of the brain and spinal cord to the appropriate parts of the cerebrum.
3. It relays motor impulses to the spinal cord from cerebrum.

HYPOTHALAMUS

It lies below the thalamus it is connect to the pituitary gland. It contain reflex centres linked to the autonomic nervous system.

FUNCTIONS

1. It regulates the internal environment of the body e.g Temperature and water content of the blood.

FUNCTIONS

It controls respiration, heartbeat, digestive movement size of blood vessels or supply of blood to different part of the body, secretion of saliva and laughing (These are involuntary actions).

PONS VAROLLI

It is a broad band of fibres that connects the two halves of the cerebellum and the cerebrum of the medulla oblongata.

FUNCTIONS

It carries impulses from one hemisphere of the cerebellum to the other thereby, coordinating muscular movement in two sides of the body.

SPINAL CORD

It is white soft tissue running through the neural canals of the vertebrae, from the medulla oblongata to the caudal tail region of an animal. The spinal cord is protected by three layers of meninges namely: Dura mater (outer layer), Arachnoids mater (middle layer), Pia mater (inner layer).

The space between these layers is occupied by a cerebrospinal fluid which acts as a protective cushion. A view of its cross section shows that the spinal cord has an outer covering of white matter surrounding outer grey matter which is cluster of cell bodies of two types of neurons association and motor neurons.

The density and granular nature of the cell bodies gives the gray appearance of the grey matter.

FUNCTIONS OF SPINAL CORD

The spinal cord carries out two main functions:

1. The connection of all the peripheral nerves to the brain for proper co-ordination
2. The second function is to act as a co-ordinating centre for simple reflex actions such as knee jerk and sweating.

Assignment

1. Explain the following terms

- (a) Spinal Nerves
- (b) Cranial nerves
- (c) Meninges
- (d) Cerebrospinal fluid

PERIPHERAL NERVOUS SYSTEM

The communication between the brain spinal cord and the entire body is provided by the peripheral nervous system. It consists of 12 pairs of cranial and 31 pairs of spinal nerves. The cranial nerves arise from the brain while the spinal nerves arise from the spinal cord.

OR The peripheral nervous system consists of the sensory nerves which lead from all parts of the body to the central nervous system to all parts of the body. The peripheral nervous system is sub-divided into the sensory-somatic and automatic nervous system.

SOMATIC NERVOUS SYSTEM

It is the nervous network that is concerned with the movement of the part of the body that contains the skeleton. It is made up of motor (efferent) neurons which connect the central nervous system with the skeleton muscles. The motor neurons are part of the cranial and spinal nerves, with their cell bodies in the CNS and fibres extending all the way to the muscles of the limbs digits, appropriate movements is limbs digits, appropriate movements is brought about by impulses which move along these fibres and are mostly voluntary.

AUTOMATIC NERVOUS SYSTEM

It is part of the peripheral nervous system which controls the involuntary actions inside the body such as the rate of heart beat, sweating, peristaltic contractions of the intestine. The neurones of automatic nervous system are connected to the involuntary muscles of (such as heart, eye, lungs, kidney, penis thus maintain a system of check and balance). The internal organs. The activities of the autonomic nervous system are under control of spinal cord or brain by reflexes called visceral reflexes which are not under the control of the brain.

The ANS consists of two parts - namely: The sympathetic and The Parasympathetic Nervous system.

SYMPATHETIC NERVOUS SYSTEM

The SNS consists of nerves which connect internal organs to lumber and thoracic areas of the spinal cord. Many parts are stimulated for necessary action in times of prolonged stress and emergency. The hormone may be released during this process.

FUNCTIONS OF SYMPATHETIC NERVOUS SYSTEM

1. They accelerate heartbeat.
2. It constricts arteries.
3. It dilates the bronchioles.
4. It contracts bladder and anal sphincters.
5. It causes the relaxion of bladder muscles.
6. It shows gut movement.
7. It raises the blood pressure.
8. It inhibits the secretion of salivary glands.

PARASYMPATHETIC NERVOUS SYSTEM

The nerve fibres leave the central nervous system in the cranial and sacral areas of the body. The parasympathetic nervous system reverses the actions of sympathetic nervous system.

Parasympathetic system stands for a quiet and easy life such as maintaining normal heartbeat, respiration, good digestion and conservation of energy.

FUNCTIONS

1. It slows down heartbeat.
2. It dilates arteries.
3. It constricts the bronchioles.
4. It constricts the iris.
5. It relaxes the bladder and sphincter.
6. It causes the contraction of the bladder muscle.
7. It speeds up gut movement.
8. It lowers the blood pressure
9. It stimulates the secretion of salivary glands. Saliva from salivary gland

THE NERVE CELL/NEURONE

They are the basic structural units of the nervous system. They transmit impulses within the body. In nerves they are closely packed together with connective tissue. The mature neurone has lost its power of regeneration.

STRUCTURE OF A NEURONE

There are numerous types of neurone but they all have the same basic structure. There are three major parts are:

1. A cell body
2. Dendron with branches called dendrites
3. The axon ending in the synaptic knob.

Assignment

Draw and practice the diagram of Neurone and it will be defended.

FORMS OF NEURONES

There are 3 types of neurone based on function.

1. Sensory neurone (afferent neurone)
2. Motor neurone (efferent neurone)
3. Relay neurone which connect the pathway of sensory and motor neurones and are found mainly in the central nervous system. Relay neurone are also known as connector, association, intermediate or inter-nuclear neurones.

THE CELL BODY: It may be angular, oval, polygonal or star-shaped. It consists of a large nucleus and dense Nissl's granulated cytoplasm. This granulation gives the cell body its grayish colour. The Golgi body is also found in the cell body. It is very active. It manufactures vesicles containing chemicals needed for the transfer of

electrical needed for the transfer of electrical impulses. The cell body received impulses from the Dendron and transmits it to the axon.

DENDRONS: They are cytoplasmic extensions or processes that branches to form many fine dendrites. The dendrons carry the nerve impulses that their dendrites received to the cell body. **DENDRITES:** Fine cytoplasmic branches of dendrons. Dendrites are the main receptive regions of the neurone and may be stimulated by sensory receptors.

Other neurones carrying impulses or changes in intercellular fluid. **OR:** They are short hair-like structures originating from the periphery of the cytoplasm. Dendrites are either in close contact with other neurones or the stimulates receptor cells. They conduct impulses (messages) to the cell body.

The Dendron of sensory neurone is very long. The Dendron of relay neurone is vey short.

AXONS: (EFFERENT NERVE FIBRE)

This is a single long fibre arising from the cell body and ending with many branches (terminal dendrites) which almost touch the dendrites of adjacent neurones. Each of branch of the axon ends in synaptic knobs. Axons can be up to a metre long as in the sciatic nerve of the leg. Axon is covered with a fatty myelin sheath and the myelin sheath is covered with neurilemma*. *In fact, neurilemma is a membrane of another cell called Schwann cell and not a part of neurone. The myelin sheath insulates and protects the axon and helps to prevent impulses from spreading from one neurone to another. At interval (about one metre). The myelin sheath is interrupted by constriction called nodes of Ranvier. The nodes of Ranvier assist in the transmission of impulses.

SYNAPSES: It is the slight gaps (20mm) between the axon ending (synaptic knobs) of 1 neurone and the dendrites of the surface of the cell body of the neighboring neurone (i.e it is a junction between the neighboring neurones).

NOTE: Axons with myelin sheath are called Myelinated axons while those without are called unmyelinated axons.

Each synaptic knob at the terminal end of the dendrite contains many synaptic vesciles which possess substance are released by the synaptic vescieles into the synaptic cleft, the substance different across the synaptic cleft thus altering the polarization of the post synaptic membrane of the dendrite or the cell body of the next neurone.

FUNCTIONS OF MYELIN SHEATH

1. It insulates the axon.
2. It speeds up transmission of nerve impulses along an axon.

FUNCTION OF SYNAPTIC KNOBS

They release chemicals (e.g acetyl choline into the synaptic gaps. The release of these chemicals brings about the transfer of electrical impulses from the end of an axon to the dendrites of the next neurone or to the cells of effectors (muscles and glands).

Ganglion is a collection of cell bodies and synapse. It is found outside the spinal cord and brain.

NERVE: A collection of hundreds of nerve fibres (axons and dendrons held together by connective tissues forms a nerve some nerves consist of only sensory or motor fibres. Others contain both sensory and motor fibres and are there for referred to as mixed nerves. Nerves and the fibres inside them are usually whitish in appearance because of the whitish myelin sheath that surrounds them.

SYNAPSE: It is the slight gap or junction between the axon endings (synaptic knobs) of one neurone and the dendritic beginning (or the surface of the cell body of another neighboring neurone. Through which nerve impulses travel by chemical means. Thus neurones are not directly connected to one another.

Assignment

Functions of Neurones

B. ANOTHER WAY OF CLASSIFYING NEURONE

Neurone can be classified based on the number of process.

1. **UNIPOLAR NEURONE:** These are neurones with one process only and it is found mainly invertebrates.
2. **BIPOLAR NEURONES:** They are neurone with two separate processes such as the neurones in the retina of the vertebrate eye.
3. **MULTIPOLAR NEURONES:** These are neurones with more than two processes such as most of the neurones invertebrates.

NOTE: The beginning of every nerve is the dendrites while the end of every nerve is the synaptic knobs

C. BASED ON WHERE THEY ARISE FROM

1. Spinal nerves
2. Cranial nerve

D. Neurones can also be grouped according to their function.

SENSORY NEURONES (AFFERENT NEURONE)

These types receive stimuli and convert the stimuli into impulses which are carried from stimulus receptors (e.g sense organs) to the central nervous system.

ASSOCIATION NEURONES

They are located only in the central nervous system. They connected sensory and motor neurons with each other and with the nerve cells in the central nervous system. They have no myelin sheath.

They transmit impulses from sensory neurones to motor neurones which enter and leave the brain.

MOTOR NEURONES (EFFERENT NEURONE)

They transmit impulses from the central nervous system to the effectors (e.g. muscles and glands) only one long axon is present. Any nerve composed of only fibres of motor neurone is called motor nerves.

MIXED NERVES

Any nerve composed of sensory and motor fibres is called mixed nerve. All the nerve connected to the spinal cord are mixed nerves. They are 31 in man.

MECHANISM OF TRANSMISSION/PROCESS BY WHICH NEURONES TRANSMIT IMPULSES THROUGH A NERVE FIBRES

Impulses are transmitted along a neurone by eletro-chemical means (that is by electrical and chemical transmission. It can be categorized into three phases

1. Resting potential
2. Action potential
3. Repolarisation phase

RESTIING POTENTIAL

When a neurone is not transmitting an impulse it is a resting neurone it is generating electricity. It generates electricity by pumping sodium ions (Na^+) out of the cell through the cell membrane. Leaving behind the chloride ions (Cl^-). When (Na^+) is pumped out, a potassium ion (K^+) is pumped into the cell. But potassium ions leak out of the cell again and sodium ions can't move into the cell because the sodium gates in the membrane are closed.

It result in a net negative change inside the neurone and positive change at the outer surface. (Therefore: the neurone is polarized). An electric potential difference is present across the neurone membrane. The difference in potential is app-70 millivolts. (i.e the resting potential).

STIMULATION OF A NEURONE (ACTION POTENTIAL)

When the cell body is stimulated it receives impulses from many dendrons and from other neurons (i.e synapse hath its surface.

NOTE: If the sum of these impulses: is large enough to overcome the neurone membrane's threshold resistance (i.e change its resting potential), the cell body can transmit the impulse to the axon.

It the membrane's resistance can't be overcome because the sum impulse is not large enough, the impulse dies off at the cell body level.

If a neurone is stimulated therefore it acts either transmits an impulse or it closes not in an all manner or none manner.

The strength of the impulse is the same either the stimulus is strong or not.

TRANSMISSION ALONG NERVE FIBRES

When the neurone's threshold is exceeded by the stimulus. At the site of stimulation the following will occur.

Sodium gates or channels open in the cell membrane enabling sodium ions to rush into the cell.

It wipes out the potential differences immediately at the site of which causes depolarization. The internal part develops a slight net positive charge with respect to the membrane's outer surface, which enable the polarity to reversed.

On depolarization, the sodium gates in the membrane closes immediately also the potassium gates in the membrane open immediately resulting in the flow of ions and the original resting potential of the membrane is established.

The above process is called referred to as action potential (PULSE).

The action potential is a stimulus it disturbed the adjacent resting membrane enabling the opening of sodium gates and the irritation of A. P. at that point. When the action potential is set up, it keeps moving until it gets to the end of the axon. It is known as a nerve impulse.

NOTE: After depolarization, the region which is active will undergo recovery period known as repolarization. It prevents nerve impulse from exciting it even if the stimulus is very strong, until a resting potential is re-established.

So a nerve impulse can move from active region to resting region.

A myelinated nerve fibre has different speed from un myelinated one.

TRANSMISSION ACROSS SYNAPSE

Neurone: Transmit impulse to another across synaptic gaps chemically this time.

At the end of an axon, the synaptic knob is stimulated to release neuro-chemical such as acetylcholine into the synaptic gaps when an electric impulse gets there.

Neurochemical which are release binds to special receptor sites on the adjacent neurone's membrane and resulting in the opening of sodium gates. It triggers an impulse from the next neurons (referred to as firing a second neurone). But enzymes quickly destroy the neurochemical such that the neurone membrane at this site can establish its resting potential.

NOTE: Neurochemicals can move from axon's synaptic knobs to the target cell's membrane as such it is transmitted in one direction.

NOTE: Cells of effectors are inhibited or excited by impulses of motor neuron. For instance (Axons of excitory neurons cause the release of stimulatory neurochemicals such as acetylcholine which cause muscle fibres to contract and gland cells to produce secretions.

Also axons of inhibitory neurones cause the release of neurochemicals like glycine which either inhibit or check muscular contractions.

NERVE POISONES

They act at the synaps and neuromuscular junctions. When a tetanus bacterium gets into the body, to produces a neurotoxin that blocks the binding and inhibit action, of glycine at the neuromuscular junctions. It can lead to an uncontrollable muscle spasms. The curare is a nerve poison that can block the binding sites of acetylcholine at neuromuscular junctions.

So they prevent the muscles from contracting and when the breathing muscles stop working death might occur.

FUNCTIONS OF THE SYNAPSE

1. It transmits information between neurones.
2. To acts as junctions allowing impulses to be divided up along many neurones or merge into one.
3. To act as valves in that they ensure that impulses pass across them in one direction.
4. To filter out low frequency impulses.

ACTIONS AND BEHAVIOUR

An action is a response to stimuli it entail nervous and endocrine systems. It can be grouped into

Reflex actions

Voluntary actions

The waxy on organisms respond to changes on their environment can be referred to as behavior. It can be grouped into instinctive behavior and learned behavior.

REFLEX ACTIONS

They are an involuntary or automatic response of the body to a stimulus involving the spinal cord or the brain. It occurs very rapidly in a stereotyped manner. When the reflex action is completed, the impulse reaches the brain. Pulling off your hand immediately from a hot object when you accidentally touch it is an example of reflex action. When you pick a hot object accidentally the sensory cells (pain receptors) in the skin are stimulated by the hot pain. The stimulus (hot pain) then initiates nerve impulses which are sent through the sensory neurone (afferent) in the spinal cord. The impulses are then transmitted through synapse into the intermediate neurone in the spinal cord.

From the intermediate neurone, the impulses are transmitted into motor neurones which then transmit the impulses to the muscles. The impulses cause the stimulation of the biceps muscles (flexor) to contract and the triceps muscles to relax. The hot object is immediately dropped.

It is very fast and we are not aware of our reflex actions until we have done them. Reflex actions protect us from dangerous stimuli hence enable us to maintain our posture and balance.

EXAMPLE

Knee jerk, sneezing, coughing, laughing when tickled, jumping when frightened blinking when the cornea is touched by a foreign body, heart beat and gut movement contraction of the pupils when a bright light is shone into the eyes (to protect the retina of the eyes).

REFLEX ARC

A reflex arc is the route or path which impulses have to pass through in order to bring about a reflex action: A reflex arc:

1. **A receptor organ (sensory receptor).** They detect and receive the stimulus.
2. **Sensory nerves:** It carries impulses from the sensory ending to the spinal cord.
3. **Sensory neurones:** Impulses are transmitted through it.
4. **The relay neurone (in CNS):** The neurone that sensory impulse is passed on.
5. **Motor nerve:** (Motor or efferent neurone). It receives the impulses from intermediate neurone and passes the impulses to the muscular. (Efferent organ) OR along which the motor impulse transmitted.
6. The effector (Muscle or gland): Motor impulse triggers to bring about an appropriate response.

Reflex arc can have two neurones i.e (Sensory and motor neurone) but some reflex arc might have three or more neurones.

NOTE: Spinal reflex is simple reflex action that only involves the spinal cord e.g the knee jerk while cranial reflex are simple reflex action that involves the brain e.g. contraction of the pupils when light is shone into the eyes.

COMPLEX REFLEX ACTIONS

It consists of neurones of different levels of the spinal column and brain. They are either the ascending or descending nerve fibres between the brain and spinal cord usually from part of the reflex arc. They are quick and automatic as well as stereotyped responses.

VOLUNTARY ACTIONS

They are actions we think about first before doing it voluntary or conscious actions.

- Walking, reading, driving, swimming, typing.
- Choosing a bottle or canned maltina from a drum of soft drinks.
- Seeing a key/money on the floor picking it up and placing it on a table.
- Feeling hungry getting a plate of food and drinking it.
- Hearing, shouts for help and deciding to run in the direction of the sound to investigate.

Assignment

1. *Differences between reflex and voluntary action.*
2. *Difference between reflex action and conditioned reflex.*