B.Sc. 3rd Semester

Subject: **Zoology (Hons.)**

Course Code: ZC306T

CORE COURSE VI

Animal Physiology: Controlling and Coordinating Systems

Name of the Teacher:

Dr. Merina Narah

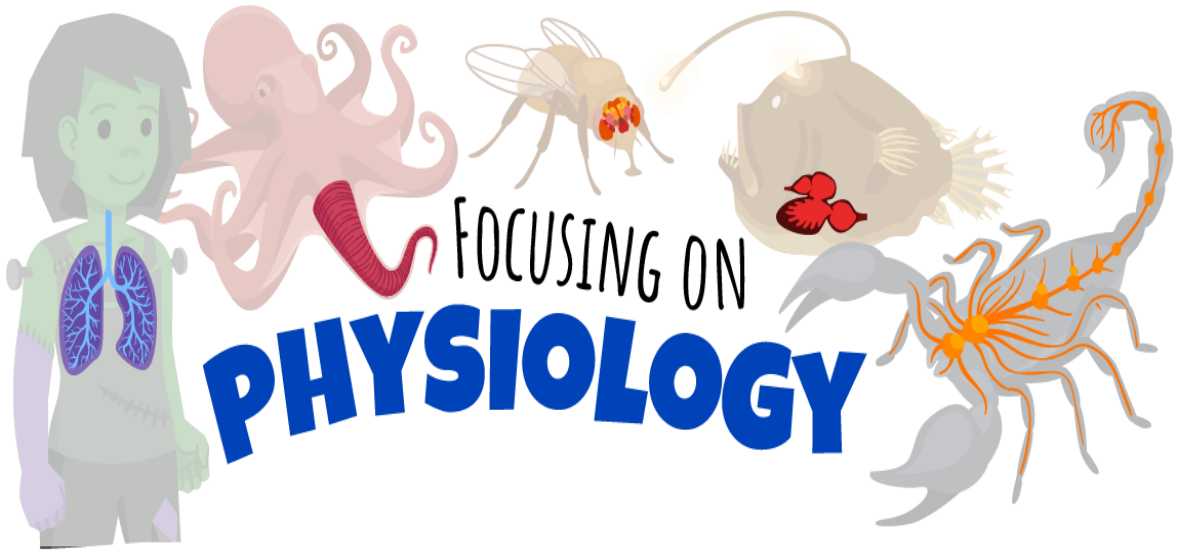
Assistant Professor

Dept.of Zoology

Silapathar College, Silapathar

Syllabus:

3rd Semester (Zoology Hons.)



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CORE COURSE VI:

ANIMAL PHYSIOLOGY: CONTROLLING AND COORDINATING SYSTEMS

**The objective of this course is to provide a foundation for understanding the complexities of the coordination system of animal body.*

THEORY (Credits 4) (Lectures=60)

Unit 1: Tissues 6 Lectures

Structure, location, classification and functions of epithelial tissue, connective tissue, muscular tissue and nervous tissue

Unit 2: Bone and Cartilage

Structure and types of bones and cartilages, Ossification, bone growth and resorption

Unit 3: Nervous System 10 Lectures

Structure of neuron, resting membrane potential, Origin of action potential and its propagation across the myelinated and unmyelinated nerve fibers; Types of synapse, Synaptic transmission and, Neuromuscular junction; Reflex action and its types - reflex arc; Physiology of hearing and vision.

Unit 4: Muscle 12 Lectures

Histology of different types of muscle; Ultra structure of skeletal muscle; Molecular and chemical basis of muscle contraction; Characteristics of muscle twitch; Motor unit, summation and tetanus

Unit 5: Reproductive System 10 Lectures

Histology of testis and ovary; Physiology of male and female reproduction; Puberty, Methods of contraception in male and female

Unit 6: Endocrine System 18 Lectures

Histology of endocrine glands - pineal, pituitary, thyroid, parathyroid, pancreas, adrenal; hormones secreted by them and their mechanism of action; Classification of hormones; Regulation of their secretion; Mode of hormone action, Signal transduction pathways for steroidal and non- steroidal hormones; Hypothalamus (neuroendocrine gland) - principal nuclei involved in neuroendocrine control of anterior pituitary and endocrine system; Placental hormones

Nervous system co-ordinate and control the activities of the animals.

The two main sub division of the nervous system are the-

- Central nervous system (CNS) which consists the *brain* and the *spinal cord*
- Peripheral nervous system (PNS) which include *cranial nerves* and their branches, *spinal nerves* and their branches.

Peripheral nervous system(PNS) is further subdivided into-

A somatic nervous system (SNS)
An Autonomic nervous system (ANS)
An enteric nervous system (ENS)

Nervous tissue:

Nervous tissue consists of two types of cells; *neurons* and *neuroglia*.

Neurons provide most of the unique functions of the nervous system, such as *sensing, thinking, remembering, controlling muscle activity* and *regulating glandular secretions*.

Neuroglia supports, nourishes and protect the neurons.

Neurons:

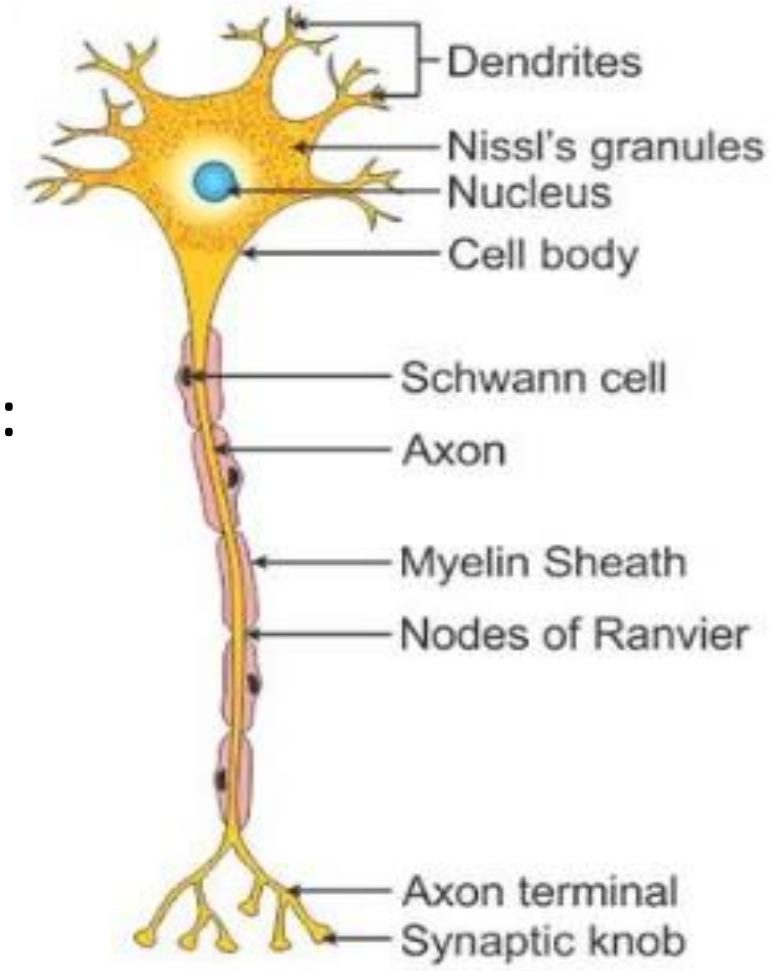
Neurons possess electrical excitability, the ability to respond to a stimulus and convert it into an action potential.

An action potential (nerve impulse) is an electrical signal that propagates (travels) along the surface of the membrane of a neuron.

Nerve impulses travel at speeds ranging from 0.5 to 130 meters per second.

Unit: 3 Nervous System

Fig. Structure of Neuron:



Parts of neuron:

Most neurons have three parts:

- A cell body
- Dendrites and
- An axon

Resting Membrane Potential-

The resting membrane potential of large nerve fibers when not transmitting nerve signals is about -90 millivolts. That is the potential inside the fiber is 90 millivolts more negative than the potential in the extracellular fluid on the outside of the fiber.

Nerve Action Potential –

Nerve signals are transmitted by action potentials which are rapid changes in the membrane potential that spread rapidly along the nerve fiber membrane. Each action potential begins with a sudden change from the normal resting negative membrane potential to a positive potential and then ends with an almost equally rapid change back to the negative potential.

Resting stage-

This is the resting membrane potential before the action potential begins. The membrane is said to be polarized during this stage because of the -90 millivolts negative membrane potential that is present.

Depolarization Stage-

At this stage the membrane suddenly becomes permeable to sodium ions, allowing tremendous numbers of positively charge sodium ions to diffuse to the interior of the axon. The normal polarized state -90 millivolts is immediately neutralized by the inflowing positively charge sodium ions, with the potential rising rapidly in the positive direction. This is called depolarization.

Repolarization stage-

Within a few 10000ths of a second after the membrane becomes highly permeable to sodium ions, the sodium channels begin to close and the potassium channels open ,more than normal. Then, rapid diffusion of potassium ions to the exterior re-establishes the normal negative resting membrane potential. This is called repolarization of the membrane.

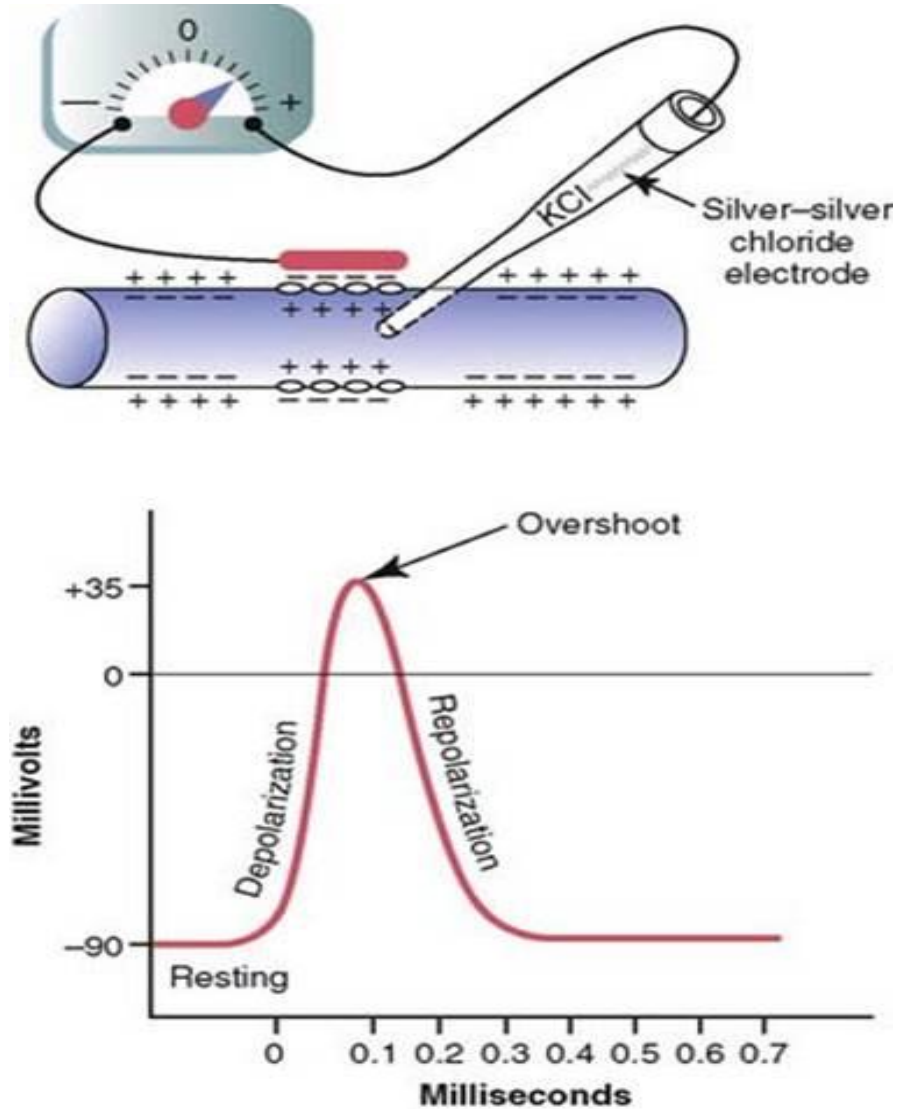


Fig: Typical action potential recorded by the method shown in the upper panel of the figure