



**CHANDIGARH
UNIVERSITY**

Discover. Learn. Empower.

INSTITUTE-UNIVERSITY INSTITUTE OF ENGINEERING

ACADEMIC UNIT-II

Computer Science Engineering

Subject Name-Biology For Engineers

Subject Code- 20SZT148

NERVOUS SYSTEM

DISCOVER . **LEARN** . EMPOWER

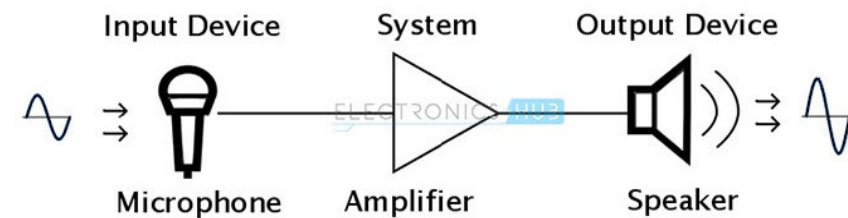
NERVOUS SYSTEM

Course Outcome

CO Number	Title	Level
CO1	It gives an idea about the about the basic cell biology.	Understanding
CO2	It deals with the idea of uses of biology in engineering.	Understanding
CO3	It provide knowledge about the uses of softwares in biology field.	Remembering

WHAT ARE TRANSDUCERS?

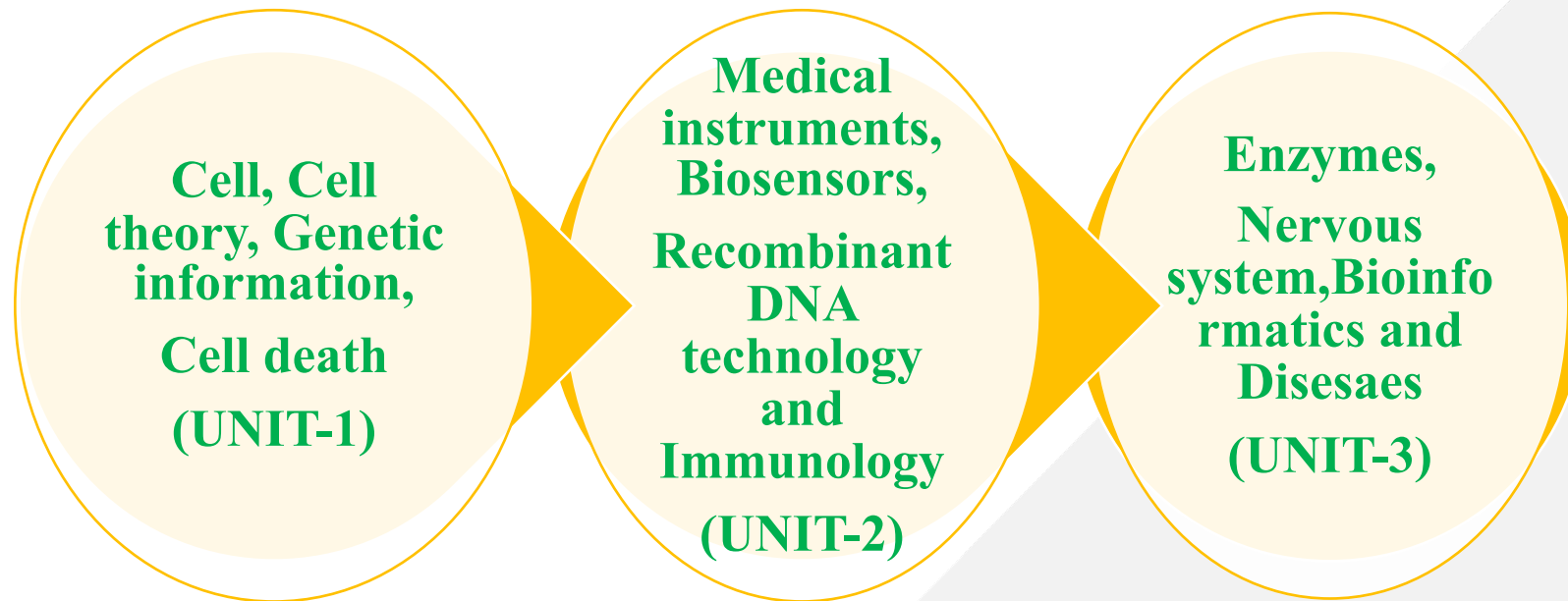
Different Types, Characteristics, Classification and Applications



Will be covered in this lecture

<https://www.electronicshub.org/types-of-transducers/>

BIOLOGY FOR ENGINEERS

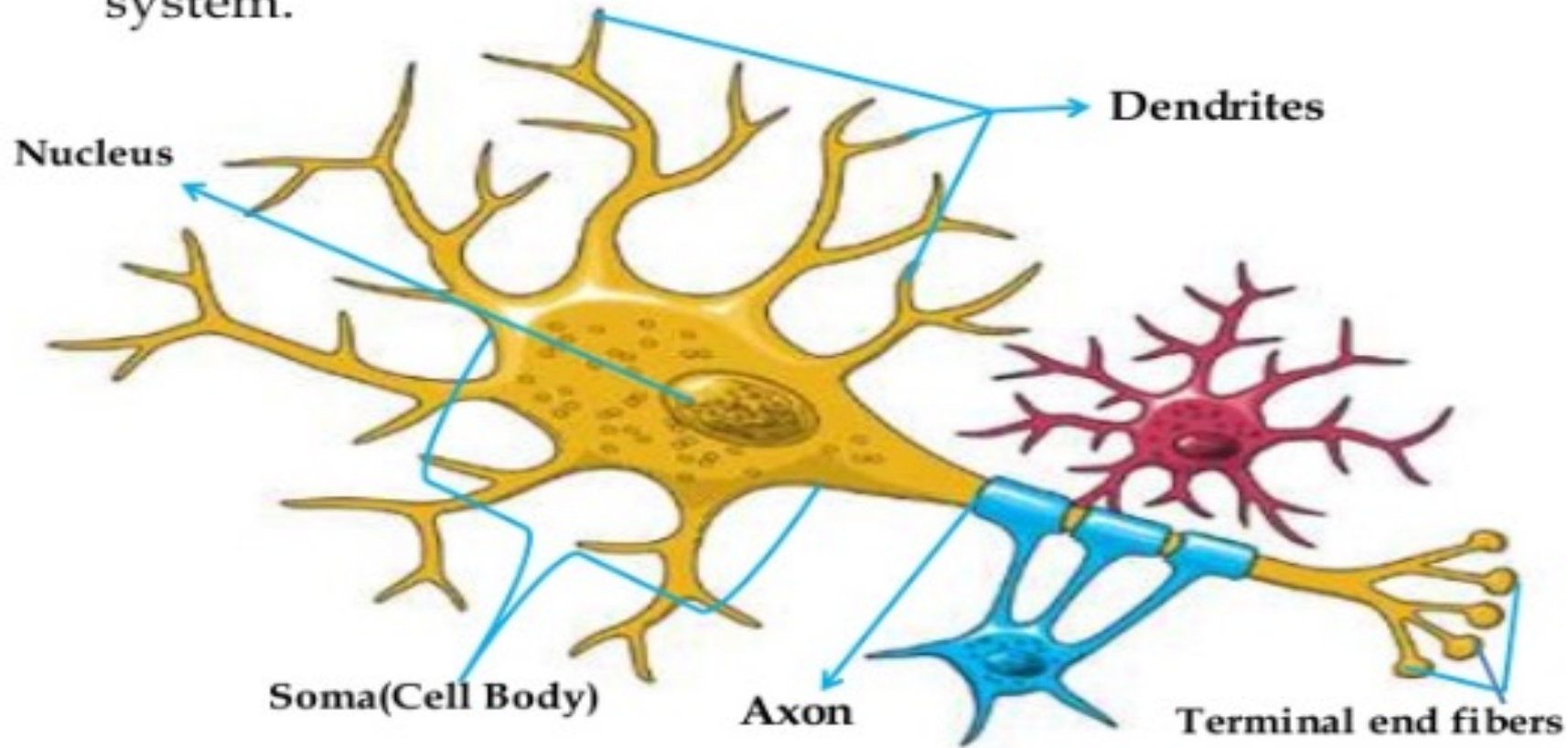


NERVOUS SYSTEM

- The nervous system is very important in helping to maintain the homeostasis (balance) of the human body.
- A series of sensory receptors work with the nervous system to provide information about changes in both the internal and external environments.
- The human nervous system is a complex of interconnected systems in which larger systems are comprised of smaller subsystems each of which have specific structures with specific functions.

Structure and function

Neurons (nerve cells) are the basic elements of the nervous system.



<https://image.slidesharecdn.com/nervoussystem-130607023751-phpapp01/95/nervous-system-3-638.jpg?cb=1370572691>

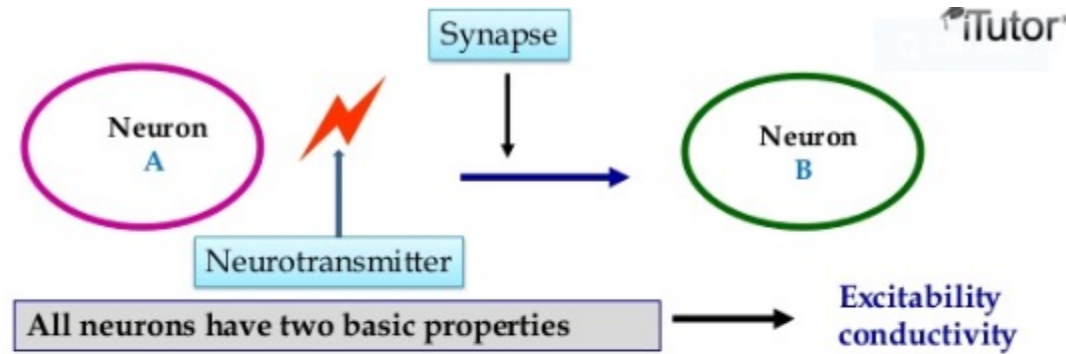
NERVOUS SYSTEM

- Neurons
 - Cell Body
 - The main processing center of the cell.
 - Dendrites
 - Thin branching extensions of the cell body that conduct nerve impulses toward the cell body.
- Axon
 - A single branch (in most neurons) which conducts nerve impulses away from the cell body.
 - Myelin sheath and neurilemma are coverings

NERVOUS SYSTEM

- Neurons
 - Impulse Transmission
 - Terminal end fibers are located at the ends of the axon and they transmit impulses leaving the neuron across a synapse to the next neuron.

NERVOUS SYSTEM

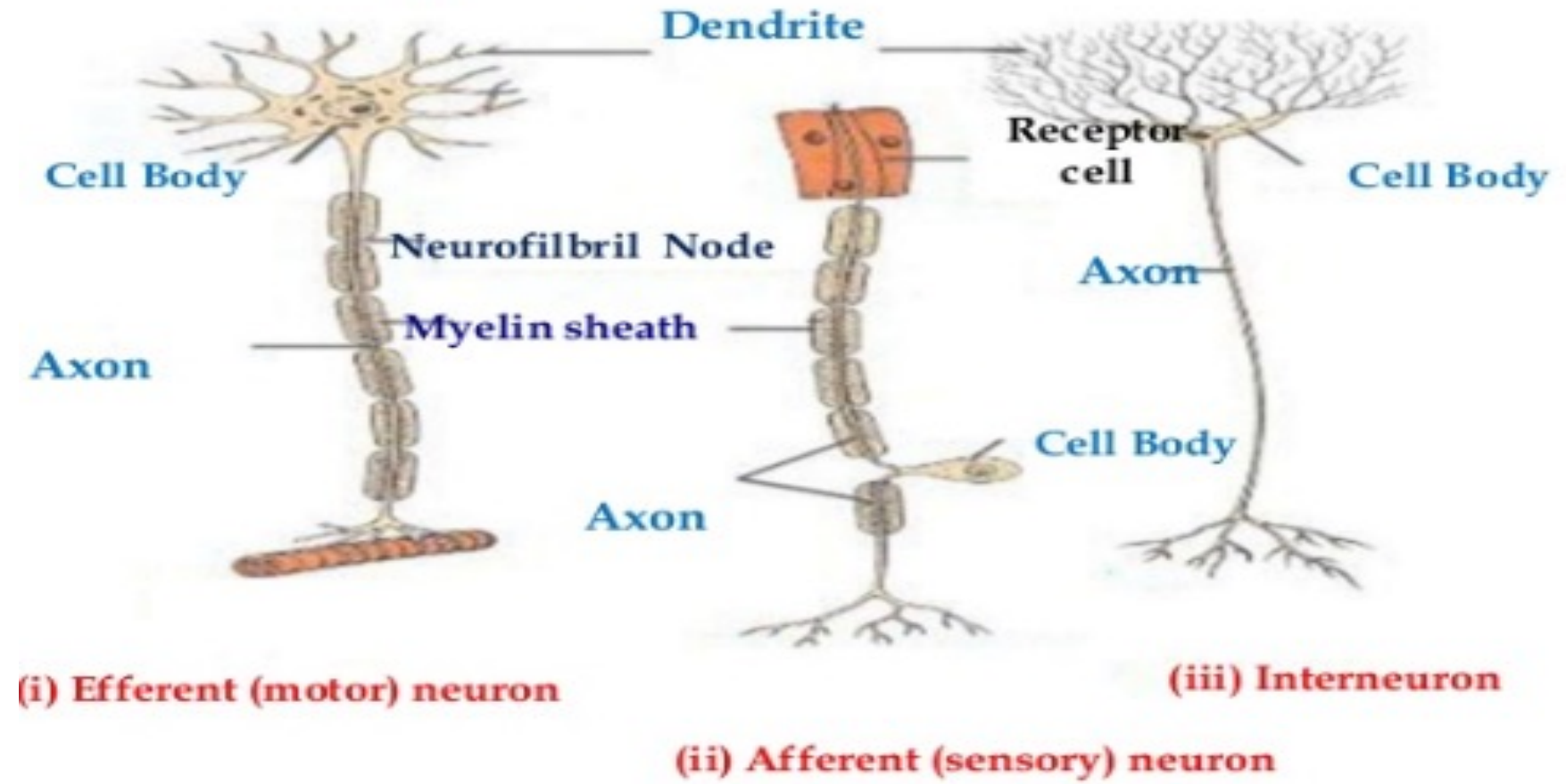


Three Types of Neurons

- Efferent (motor)
 - Conveys information from the CNS to muscles and glands.
- Afferent (sensory)
 - Carry information from sensory receptors to the CNS.
- Interneuron
 - Carry and process sensory information.

<https://image.slidesharecdn.com/nervoussystem-130607023751-phpapp01/95/nervous-system-5-638.jpg?cb=1370572691>

Types of Neurons



<https://image.slidesharecdn.com/nervoussystem-130607023751-phpapp01/95/nervous-system-5-638.jpg?cb=1370572691>

NERVOUS SYSTEM

Neuroglia

- Support, protect, connect and remove debris from the nervous system
- Types of Neuroglial Cells



Astrocytes



Oligodendroglia



Microglia

<https://image.slidesharecdn.com/nervoussystem-130607023751-phpapp01/95/nervous-system-5-638.jpg?cb=1370572691>

NERVOUS SYSTEM

- All bodily activities, voluntary and involuntary, are controlled by the nervous system.
- Two Major Components—
 - Central Nervous System (CNS)
 - Made up of the brain and spinal cord—
 - Peripheral Nervous System (PNS)
 - Made up of all the nerves that lead into and out of the CNS

NERVOUS SYSTEM

- The central nervous system is composed of two major interconnected organs:
 - – The brain
 - – The spinal cord.
- These organs work together to integrate and coordinate sensory and motor information for the purpose of controlling the various tissues, organs, and organ systems of the body.
- The central nervous system is responsible for higher neural functions, such as memory, learning, and emotion

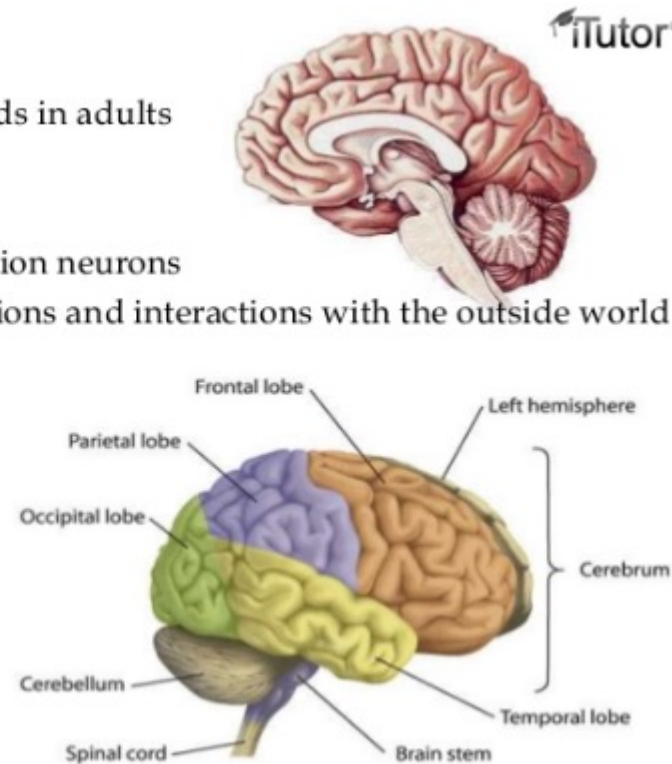
NERVOUS SYSTEM

Brain

- Weighs about 3 pounds in adults
- 75% water
- 20% of oxygen
- Contains over 100 billion neurons
- Controls bodily functions and interactions with the outside world

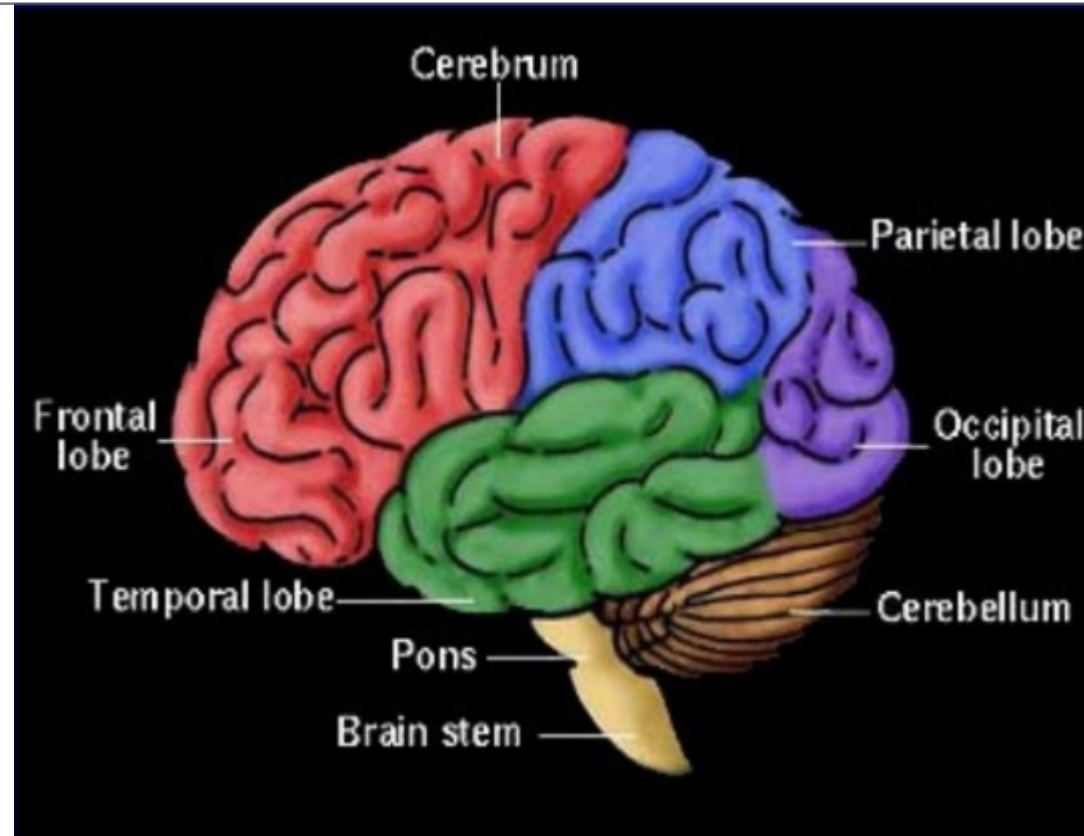
Four Parts:

- ☐ Cerebrum
- ☐ Diencephalons
- ☐ Brain stem
- ☐ Cerebellum



<https://image.slidesharecdn.com/nervoussystem-130607023751-phpapp01/95/nervous-system-5-638.jpg?cb=1370572691>

NERVOUS SYSTEM

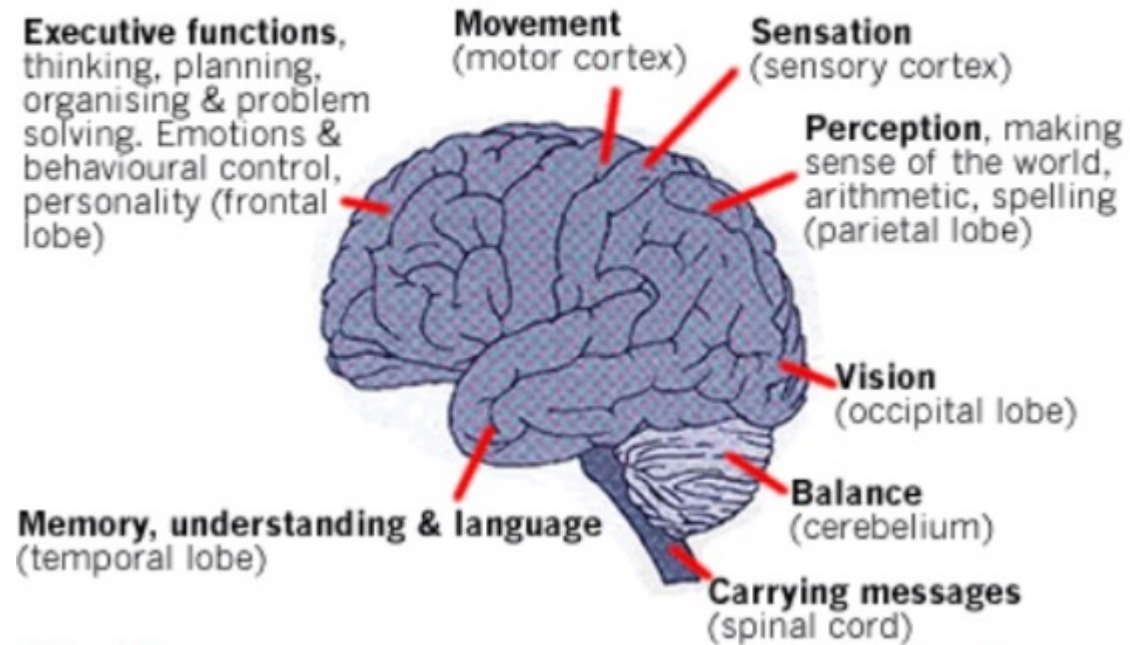


<https://image.slidesharecdn.com/nervoussystem-130607023751-phpapp01/95/nervous-system-5-638.jpg?cb=1370572691>

NERVOUS SYSTEM

The Brain and its functions

Based on Diagrams from
Head injury - A Practical Guide By Trevor Powel



<https://image.slidesharecdn.com/nervoussystem-130607023751-phpapp01/95/nervous-system-5-638.jpg?cb=1370572691>

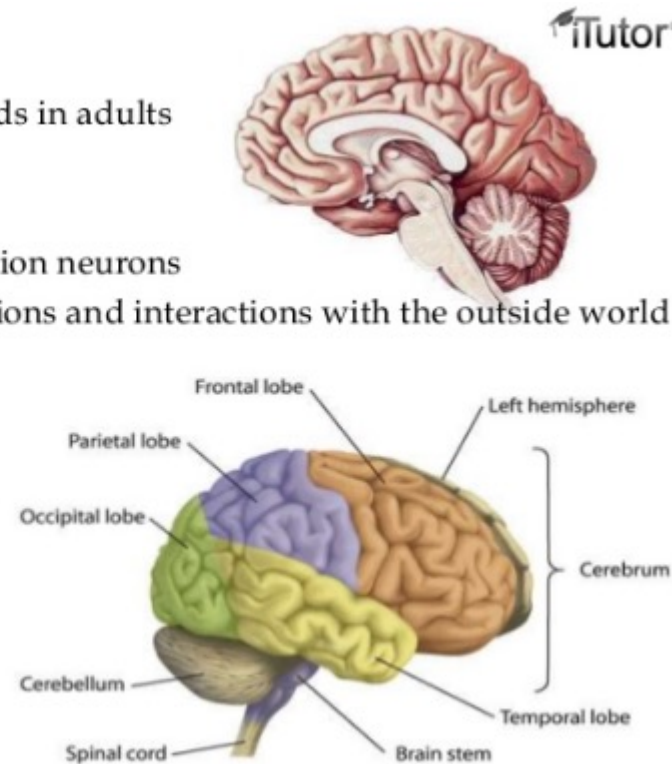
NERVOUS SYSTEM

Brain

- Weighs about 3 pounds in adults
- 75% water
- 20% of oxygen
- Contains over 100 billion neurons
- Controls bodily functions and interactions with the outside world

Four Parts:

- ☐ Cerebrum
- ☐ Diencephalons
- ☐ Brain stem
- ☐ Cerebellum



<https://image.slidesharecdn.com/nervoussystem-130607023751-phpapp01/95/nervous-system-5-638.jpg?cb=1370572691>

Brainstem

- Made up of the midbrain; Pons and the medulla oblongata.

Midbrain : Involved with visual reflexes

Pons:

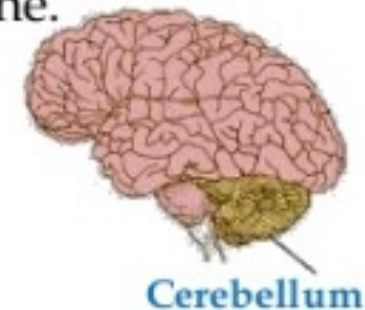
- Located between the midbrain and the medulla oblongata
- Controls certain respiratory functions

Medulla Oblongata:

- Contains centers that regulate heart and lung functioning, swallowing, coughing, vomiting and sneezing

Cerebellum

- Area that coordinates musculoskeletal movement to maintain posture, balance, and muscle tone.
- Inferior to the occipital lobes of the cerebrum.
- Posterior to the pons and medulla oblongata .



iTutor, 2000-2013. All Rights Reserved

<https://image.slidesharecdn.com/nervoussystem-130607023751-phpapp01/95/nervous-system-5-638.jpg?cb=1370572691>

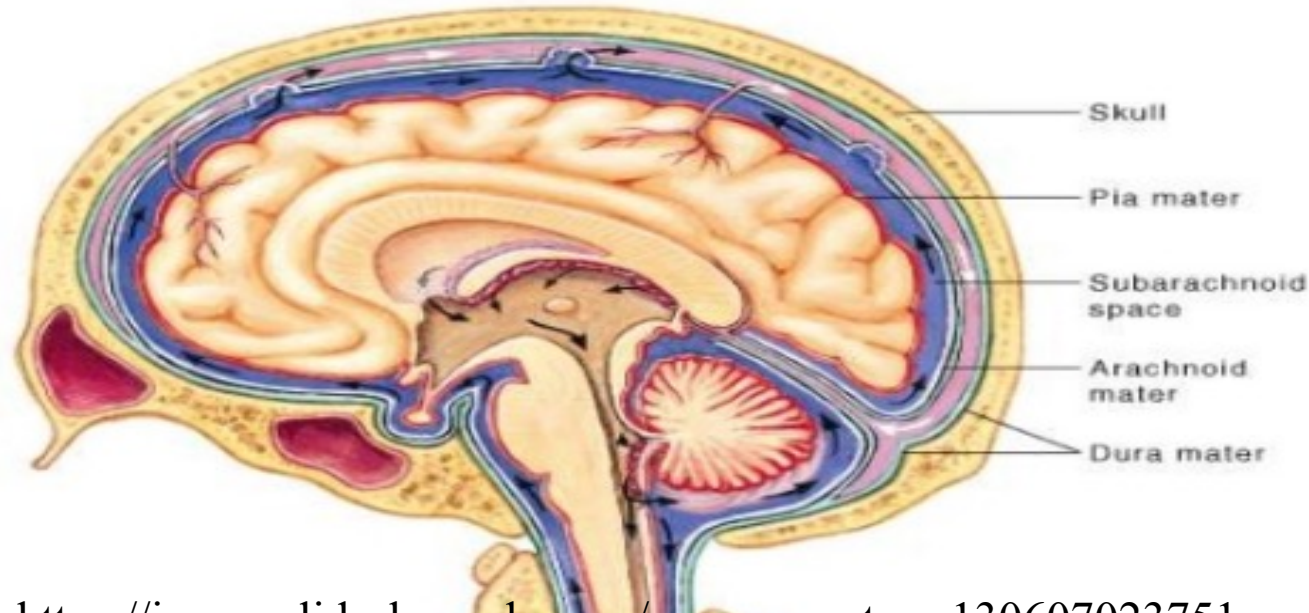
NERVOUS SYSTEM

- Cerebrum: Located above the cerebellum.
- Contains two hemispheres with an outer portion called the cerebral cortex.
- The two hemispheres are connected by a bridge of nerve fibers that relay information between the two hemispheres called the corpus callosum.
- The left and right lobes are each divided into four lobes or parts
 - parietal lobe
 - Frontal lobe
 - Temporal lobe
 - Occipital lobe
- Diencephalon: The deep portion of the brain containing:
- Thalamus• Hypothalamus• Epithalamus•

NERVOUS SYSTEM

Serves as relay center for sensations like:

- Heart rate
- Blood pressure
- Temperature control
- Behavioral responses
- Digestive functions
- Water and electrolyte balance



<https://image.slidesharecdn.com/nervoussystem-130607023751-phpapp01/95/nervous-system-5-638.jpg?cb=1370572691>

NERVOUS SYSTEM

- Spinal Cord: Extends from the medulla oblongata of the brain to the area around the first lumbar vertebra in the lower back.
- Nerves from the peripheral nervous system extend out from the spinal cord.
- Protected by: Vertebral column, Meninges are three layers of membranes that cover the brain and spinal cord.

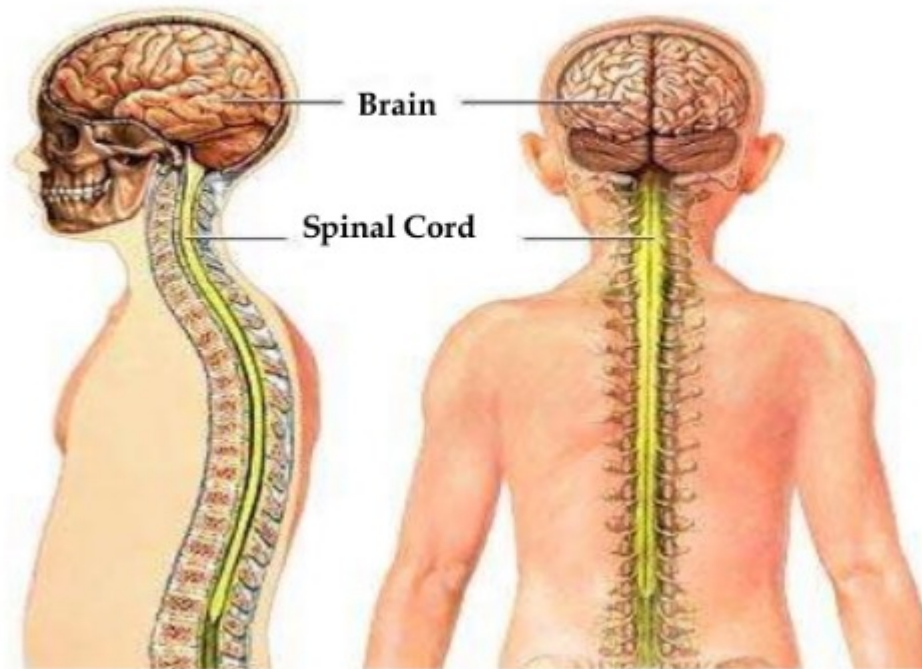
NERVOUS SYSTEM

Layers of the meninges

- Dura mater
- Outer tough fibrous membrane.
- Arachnoid mater
- Middle weblike membrane containing CSF.
- Pia mater: Innermost layer containing several blood vessels.
- Cerebrospinal fluid □ Meninges

NERVOUS SYSTEM

Central Nervous System



for. 2000-2013. All Rights Reserved

<https://image.slidesharecdn.com/nervoussystem-130607023751-phpapp01/95/nervous-system-5-638.jpg?cb=1370572691>

NERVOUS SYSTEM

Peripheral Nervous System

- The peripheral nervous system (PNS) is a collection of **peripheral nerves, ganglia** and specialized sensory structures that, as a system, carries sensory and motor information between the central nervous system and all other organs and tissues of the body.
- The peripheral nervous system is functionally divided into two major divisions:
 - The Sensory or Afferent Division
 - The Motor or Efferent Division
 - The Somatic Nervous System
 - The Autonomic (Visceral) Nervous System.



<https://image.slidesharecdn.com/nervoussystem-130607023751-phpapp01/95/nervous-system-5-638.jpg?cb=1370572691>

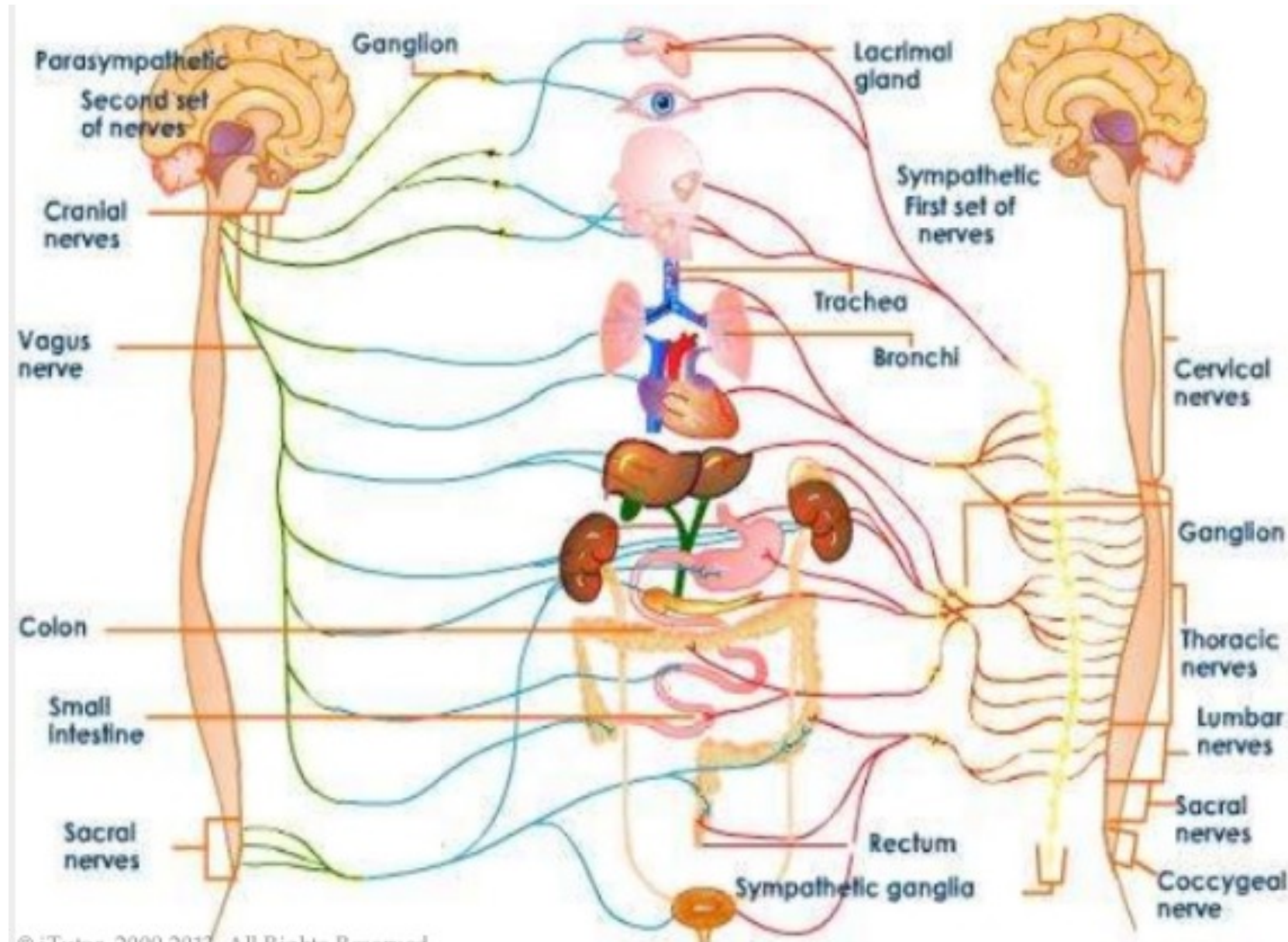
NERVOUS SYSTEM

Peripheral Nervous System

- Consists of 12 pairs of cranial nerves and 31 pairs of spinal nerves

S. No	Cranial Nerves	Function
1	Olfactory	Sense of smell
2	Optic	Sense of vision
3	Oculomotor	Eye movements
4	Trochlear	Aids muscles that move the eyes
5	Trigeminal	Eyes, tear glands, scalp, forehead, teeth, gums, lips, and mouth muscles
6	Abducens	Muscle conditioning
7	Facial	Taste, facial expressions, tear and salivary glands

<https://image.slidesharecdn.com/nervoussystem-130607023751-phpapp01/95/nervous-system-5-638.jpg?cb=1370572691>



<https://image.slidesharecdn.com/nervoussystem-130607023751-phpapp01/95/nervous-system-5-638.jpg?cb=1370572691>

NERVOUS SYSTEM

Somatic Nervous System



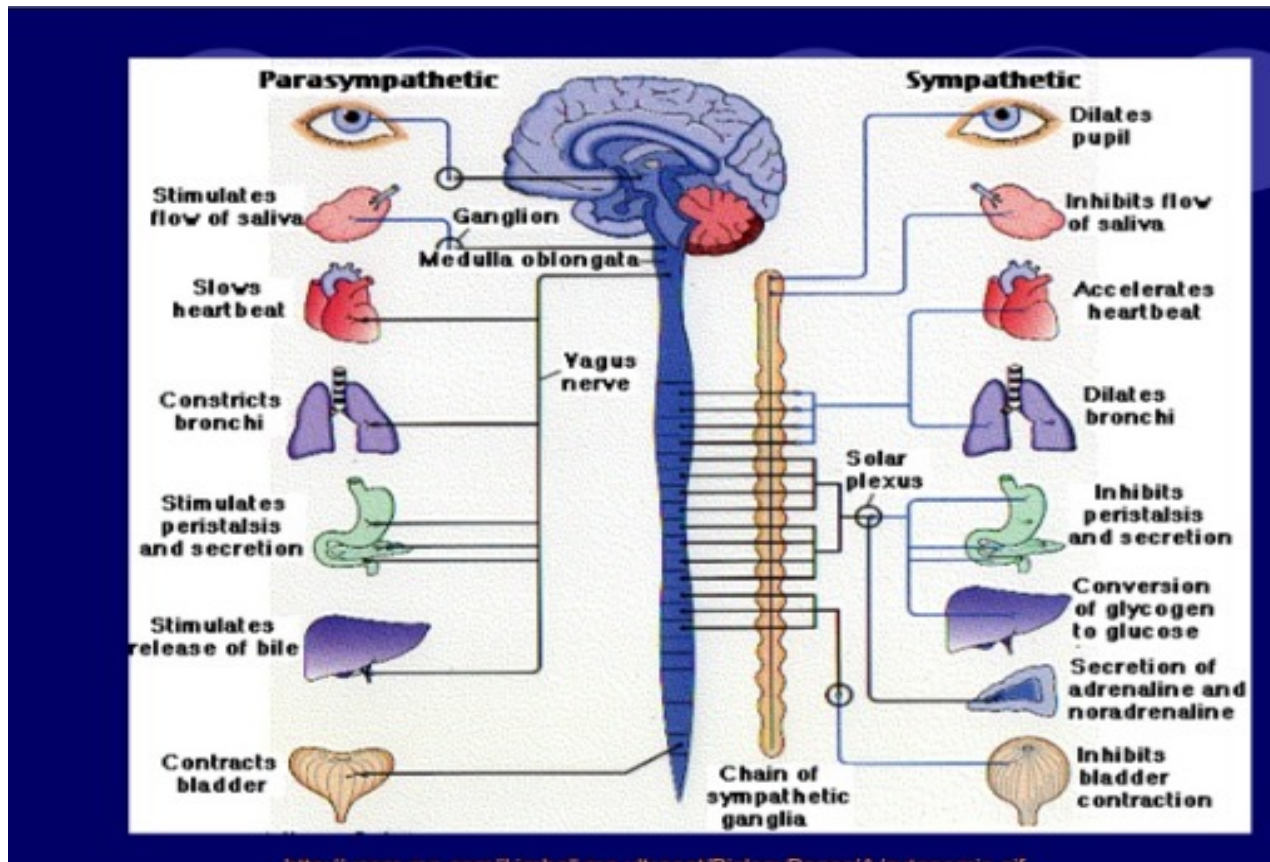
- Responsible for receiving and processing sensory input from the skin, muscles, tendons, joints, eyes, tongue, nose and ears as well as excite the voluntary contraction of skeletal muscles.

Autonomic Nervous System

- Carries impulses from the central nervous system to glands, various smooth muscles, cardiac muscle and various membranes.
- Stimulates organs, glands, and senses.

<https://image.slidesharecdn.com/nervoussystem-130607023751-phpapp01/95/nervous-system-5-638.jpg?cb=1370572691>

NERVOUS SYSTEM



<https://image.slidesharecdn.com/nervoussystem-130607023751-phpapp01/95/nervous-system-5-638.jpg?cb=1370572691>

NERVOUS SYSTEM

Reflexes

- Involuntary, automatic response to a stimulus
- Involves a simple nerve pathway called a reflex arc

<https://image.slidesharecdn.com/nervoussystem-130607023751-phpapp01/95/nervous-system-5-638.jpg?cb=1370572691>

CONCLUSION

- A series of sensory receptors work with the nervous system to provide information about changes in both the internal and external environments.
- Neurons
 - Cell Body
 - The main processing center of the cell.
 - Dendrites
 - Thin branching extensions of the cell body that conduct nerve impulses toward the cell body.

ASSESSMENT PATTERN

Assessment Pattern	Total Marks
1 st Hourly Test	36
2 nd Hourly Test	36
Surprise Test	12
Assignment (3)	10
Quiz	4
End Semester Examination	60

REFERENCES

- C.B.Powar, 2010.Cell Biology.5th Ed,Himalyan Publishing House.
- Leshie Cromwell, Fred.J. Weibell and Erich.A.Pfeiffer. 2003. Biomedical instrumentation and measurements. 2nd edition, PHI.
- John G. Webster 1998. Medical Instrumentation: Applications and Design, 3rd edition, Jon Wiley and Sons, New York.
- Jeremy M. Berg, John L. Tymoczko and Lubert Stryer. 2006. “Biochemistry,” 6th Ed. W.H. Freeman and Co. Ltd.
- Robert Weaver. 2012 “Molecular Biology,” 5th Edition, MCGraw-Hill.
- Jon Cooper, , 2004. “Biosensors A Practical Approach” Bellwether Books.
- Martin Alexander, 1994 “Biodegradation and Bioremediation,” Academic Press.



THANK YOU

For queries
Email: subject_code_2020@gmail.com