Normal Cells of The CNS

CNS Block

OBJECTIVES:

At the end of this lecture, you should describe the microscopic structure and the function of:

1- Neurons:

- **Cell body (perikaryon).**
- **Processes: An axon and dendrites.**

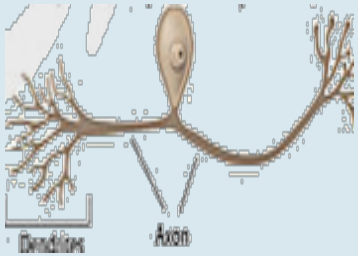
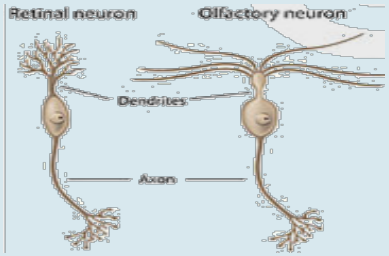
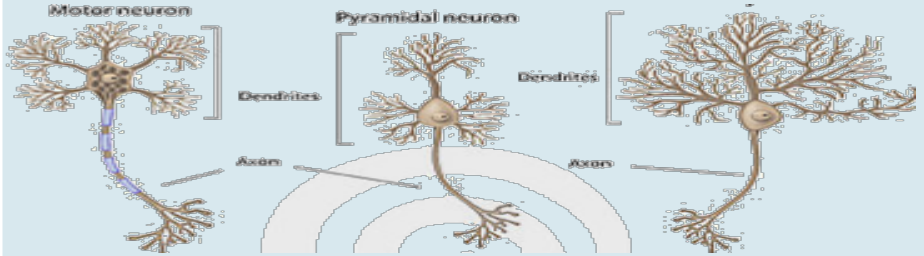
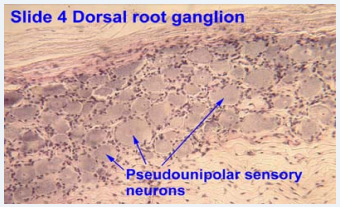
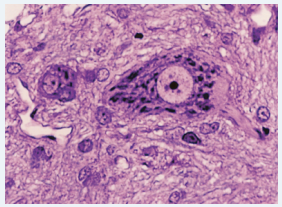
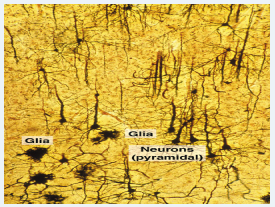
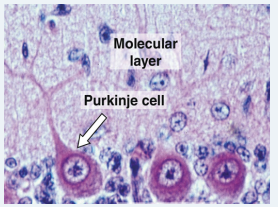
2- Neuroglia:

- **Astrocytes.**
- **Oligodendrocytes.**
- **Microglia.**
- **Ependymal cells.**

Neuron

Types of Neurons

Based on number of processes

	Unipolar Psuedo-unipolar	Bipolar Spindle-shaped	Multipolar		
			Stellate	Pyramidal	Pyriform
# of Processes	One process only that divides into two branches; one acts as a dendrite and the other as an axon.	Has two processes, one arising from each pole of the cell body	one axon and multiple dendrites		
			Commonest type		Pear-shaped
Distribution	Mesencephalic nucleus of Trigeminal nerve and Dorsal Root (spinal) Ganglion.	Retina & Olfactory Epithelium.	In most areas of CNS e.g. Anterior horn cells of the Spinal Cord	Distributed in Motor area 4 of the cerebral cortex.	Purkinje cells of Cerebellar Cortex
Diagram					
Under Microscope					

Neuron

Components of Neurons

Cell Body
"Perikaryon"

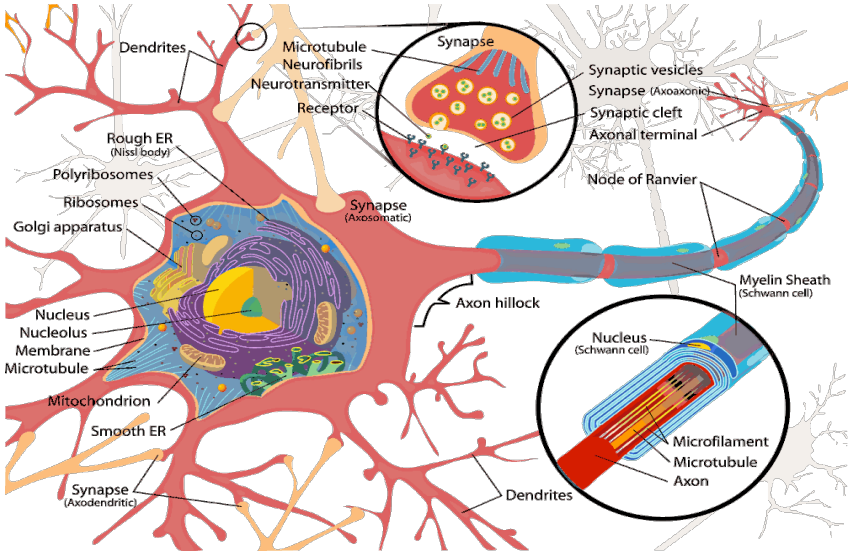
Nucleus
Single, central, rounded and vesicular with prominent nucleolus

Cytoplasm

Processes

Axon
Only one

Dendrites
One or more



Nissl Bodies
They are basophilic patches of rough Endoplasmic Reticulum and free ribosomes in the cell body and bases of wide dendrites.

Neurofilaments
Intermediate filaments which are bundled together to form neurofibrils. Are found in the cell body, axon and dendrites

Microtubules
Are found in the cell body, axon and dendrites

Centriole
Most adult neurons have only **one** rudimentary centriole, so they cannot divide.

Mitochondria
They are numerous "plenty"

Golgi Apparatus
Surrounds the nucleus all around

Fat & Glycogen Pigments

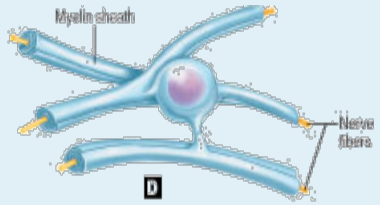
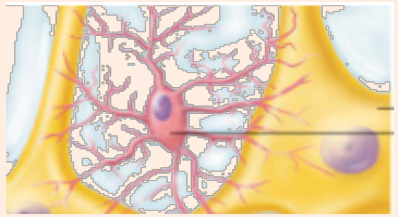
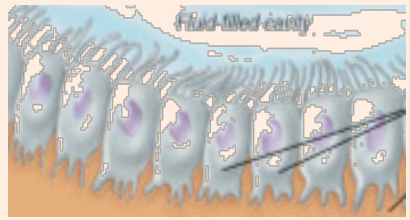
Pigments

Lipofuscin Pigments
(in old age)

Melanin Pigments
(in neurons of substantia nigra of the midbrain).

Neuroglia

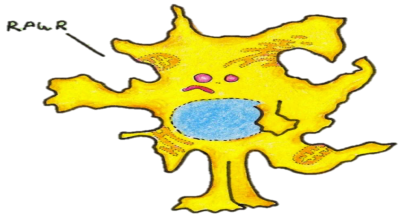
They are a group of cells that act as supportive tissue of CNS.

	Astrocytes	Oligodendro-cytes	Microglia	Ependymal Cells
	•Common •Star-shaped	•Branched •Few & short process	•Spindle-shaped •Rich in lysosomes	• Simple columnar Epithelial Cells "Partially ciliated
	In Grey & White Matters			•Lining brain ventricles & Central canal of spinal cord
Functions	•Repair Injury •Support & Nutrition •Form BBB	•Formation of myelin sheath in CNS •Insulation	•Phagocytosis	
				

Types

Protoplasmic Astrocytes

- Found in the grey matter of CNS
- Their processes branch extensively



Fibrous Astrocyte

- Found on the White Matter of CNS
- Their processes have fewer branches but longer

Summary

Neurons:

Components of Cell Body (Perikaryon)	
1-Nucleus	Single, central, rounded
2-Cytoplasm	1-Nissal bodies 2-Neurofilaments 3-Microtubles 4-Golgi apparatus 5-Mitochodeia 6-Centriole 7-Fat & glycogen granules

Number of Processes	
1-Unipolar (Psedounipolar)	One process, divides into two branches
2-Bipolar (Spindle - Shaped Neuron)	Two processes, one is dendrite the other is axon
3-Multipolar	1-Stellate neuron (common) 2-Pyramidal neuron 3-pyriform neurons

Type of Nerve Fibers in CNS	
Unmyelinated (In grey matter)	Myelinated (In white matter)

Neuroglia:

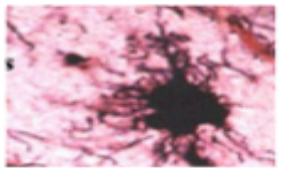
A group on cells that act as the supportive tissue of CNS

Astrocytes

1-Protoplasmic Astrocytes
2-Fibrous Astrocytes

Functions:

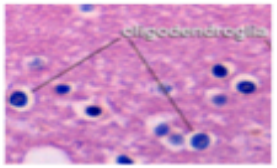
A.Repair of injury of CNS tissue
B.Supportive and nutritive functions
C.participate in the formation of blood-brain barrier



Oligodendrocytes

Functions:

A.formation of myelin sheath in the CNS
B.Insulation of nerve fibers

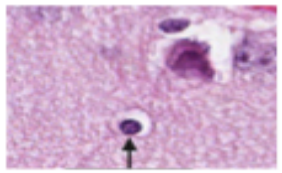


Microglia

- Distributed in grey & white matter
- Rich in lysosomes

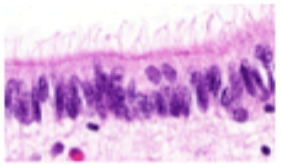
Function:

Phagocytosis



Ependymal Cells

- Simple columnar epithelial cells
-Lining brain ventricals and central canal of spinal cord



MCQs

1) The mesencephalic nucleus of trigeminal nerve is and example of which type of neurons?

A. Bipolar neurons.
B. Multipdolar neurons.
C. Pseudounipolar neurons.

2) The Stellate neuron can be found at the?

A. Cerebellar cortex.
B. Anterior horn cells of the spinal cord.
C. Cerebral cortex.

3) Which of the following is not a type of multipolar neurons?

A. Stellate neurons.
B. Pseudo-unipolar.
C. Pyramidal neurons.

4) Which type of Neuroglia cells participate in the formation of blood brain barrier?

A. Microglia.
B. Astrocytes.
C. Ependyma.

5) _____ are basophilic patches of rough endoplasmic eeticulum and free ribosomes in the cell body of neurons

A. Centrioles
B. Mitochondria
C. Nissl Bodies

6) Formation of Mylein Sheath in CNS and insulation is the main function of?

A. Oligo-dendrocytes.
B. Astrocytes.
C. Ependyma.

Answers

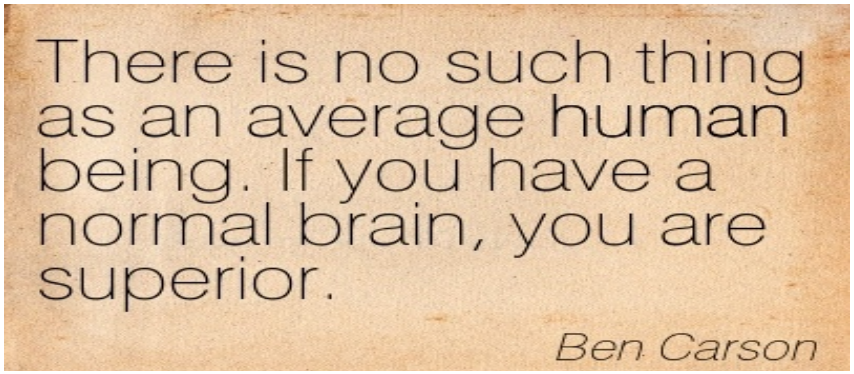
1) C 5) C
2) B 6) A
3) B 7) F
4) B 8) T

TRUE OR FALSE:

7) Gray matter contains Nerve fibers that are myelinated without neurilemmal sheath.

8) The main Function of Microglia is Phagocytosis.

Motivation Corner



Ben Carson: an American author, politician, and retired Johns Hopkins neurosurgeon
https://www.youtube.com/watch?v=dC7szh6ETQk

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Thank you for checking our work

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