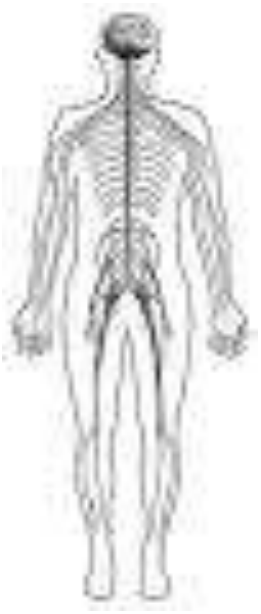
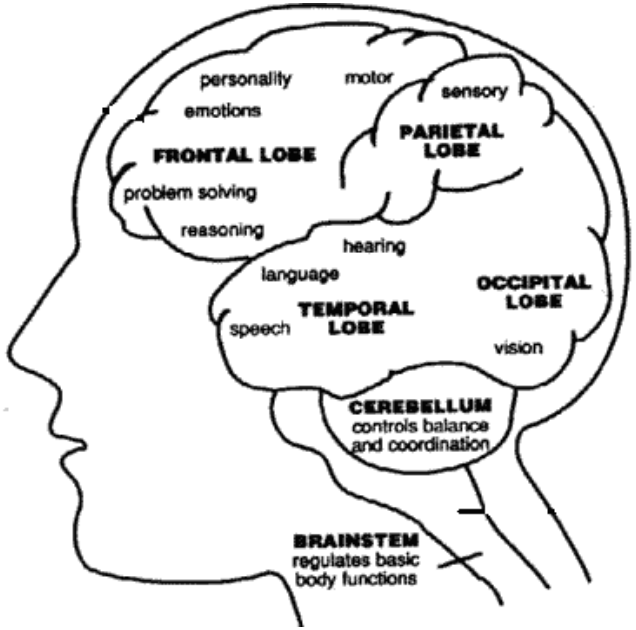
The nervous system





EXAM GUIDELINES – 2021

CONTENT	ELABORATION
Introduction	❑ The nervous system (involving nerves) and endocrine system (involving hormones) are two components that help humans respond to the environment
Human nervous system	❑ The need for a nervous system in humans: • Reaction to stimuli (stimuli can be external and internal) • Coordination of the various activities of the body
Central nervous system	❑ The brain and spinal cord are protected by meninges ❑ Location and functions of the following parts: • Brain o Cerebrum o Cerebellum o Corpus callosum o Medulla oblongata • Spinal cord
Peripheral nervous system	❑ Location and functions of the peripheral nervous system (cranial and spinal nerves)
Autonomic nervous system	❑ Location and functions of the autonomic nervous system (sympathetic and parasympathetic sections)
Structure and functioning of a nerve	❑ Nerves send and carry signals to and from all parts of the body and are made up of neurons (sensory or motor) ❑ Functions of sensory and motor neurons ❑ Structure and functions of parts of sensory and motor neurons, using diagrams: nucleus, cell body, cytoplasm, myelin sheath, axon and dendrites

EXAM GUIDELINES – 2021

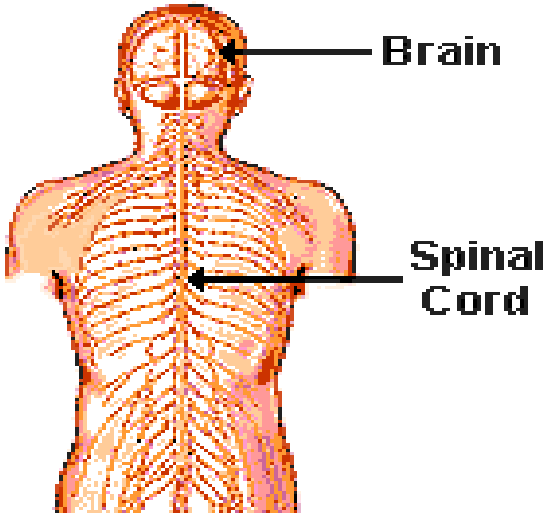
The simple reflex arc	❑ Definition of a reflex action and a reflex arc ❑ Structure of a reflex arc and functions of each part, using a diagram: receptor, sensory neuron, dorsal root of spinal nerve, spinal cord, interneuron, motor neuron, ventral root of spinal nerve, effector ❑ Functioning of a simple reflex action, using an example ❑ Significance of a reflex action ❑ Significance of synapses
Disorders of the CNS	❑ Causes and symptoms of the following disorders of the nervous system: • Alzheimer's disease • Multiple sclerosis
Receptors	❑ Functions of receptors, neurons and effectors in responding to the environment ❑ The body responds to a variety of different stimuli, such as light, sound, touch, temperature, pressure, pain and chemicals (taste and smell). (No structure and names necessary except for names of the receptors in the eye and ear.)

What is the function of the nervous system?

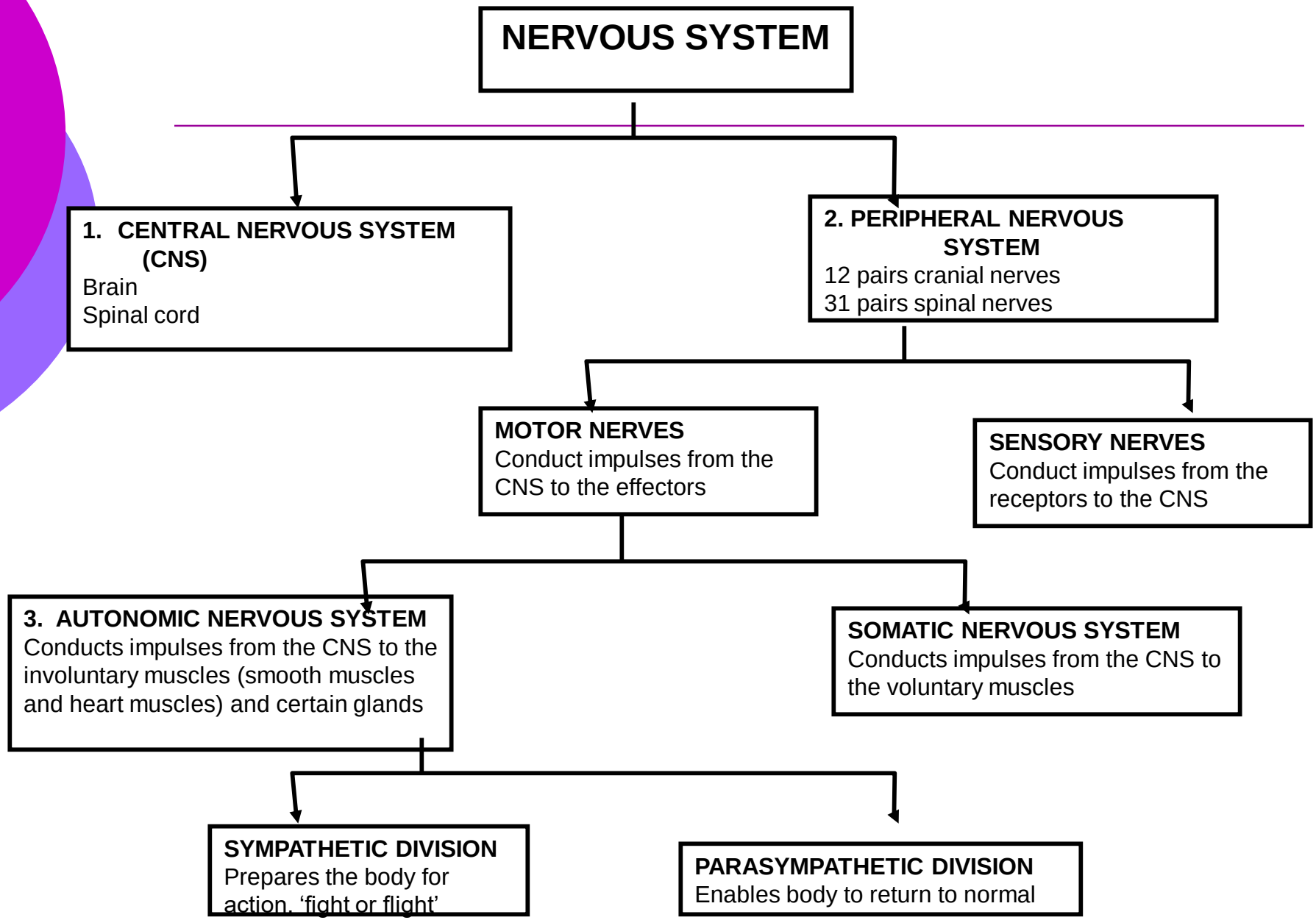
Our survival depends on us being sensitive to our surroundings. We need to be able to detect any changes and be able to respond to them.

What is the nervous system made up of?

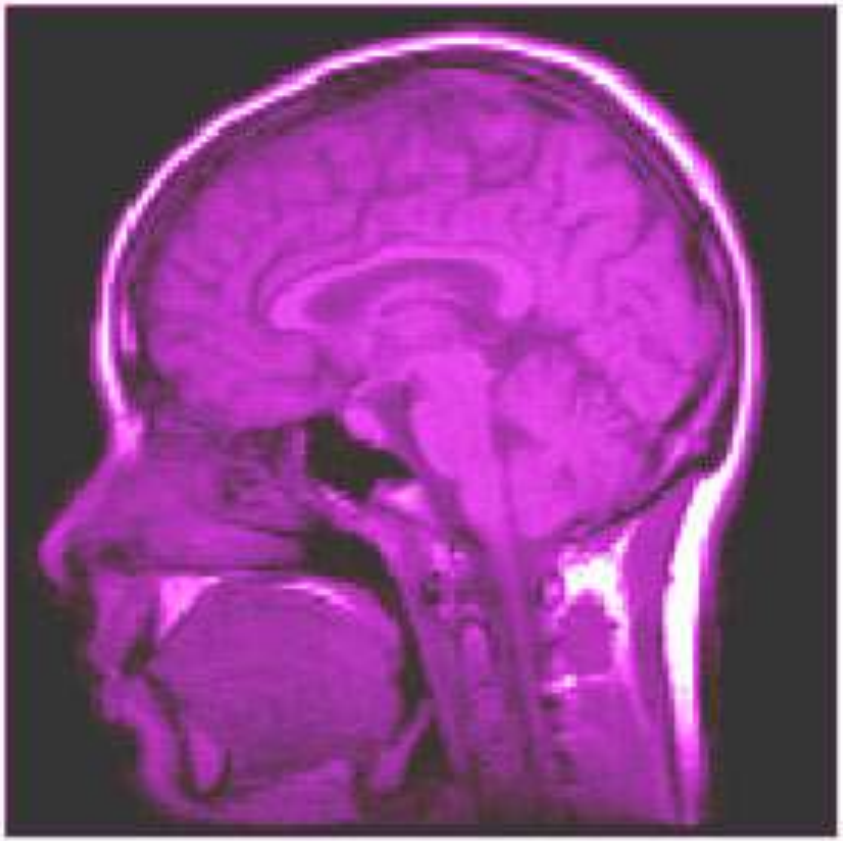
- The brain
- The spinal cord
- The nerves (consist of neurons)



The central nervous system (or CNS for short) is made up of the brain and the spinal cord.

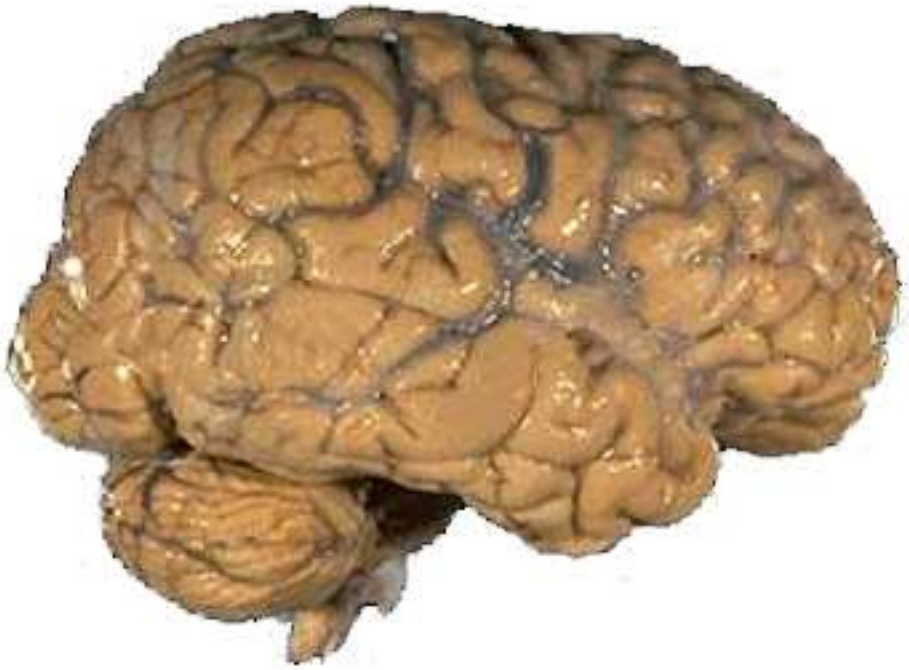

NERVOUS SYSTEM
1. CENTRAL NERVOUS SYSTEM (CNS)
Brain
Spinal cord
2. PERIPHERAL NERVOUS SYSTEM
12 pairs cranial nerves
31 pairs spinal nerves
MOTOR NERVES
Conduct impulses from the CNS to the effectors
SENSORY NERVES
Conduct impulses from the receptors to the CNS
3. AUTONOMIC NERVOUS SYSTEM
Conducts impulses from the CNS to the involuntary muscles (smooth muscles and heart muscles) and certain glands
SOMATIC NERVOUS SYSTEM
Conducts impulses from the CNS to the voluntary muscles
SYMPATHETIC DIVISION
Prepares the body for action, 'fight or flight'
PARASYMPATHETIC DIVISION
Enables body to return to normal

The Brain

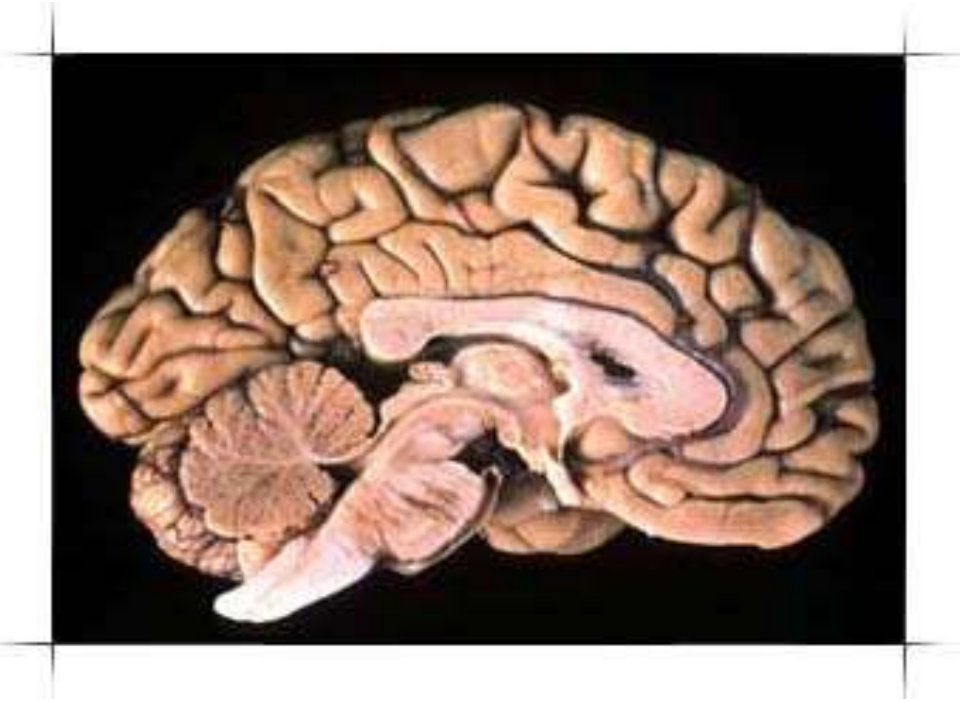


- weighs 1300 - 1400 g
- made up of about 100 billion neurons
- "the most complex living structure in the universe"
  Society for Neuroscience
- makes us who we are

The Brain

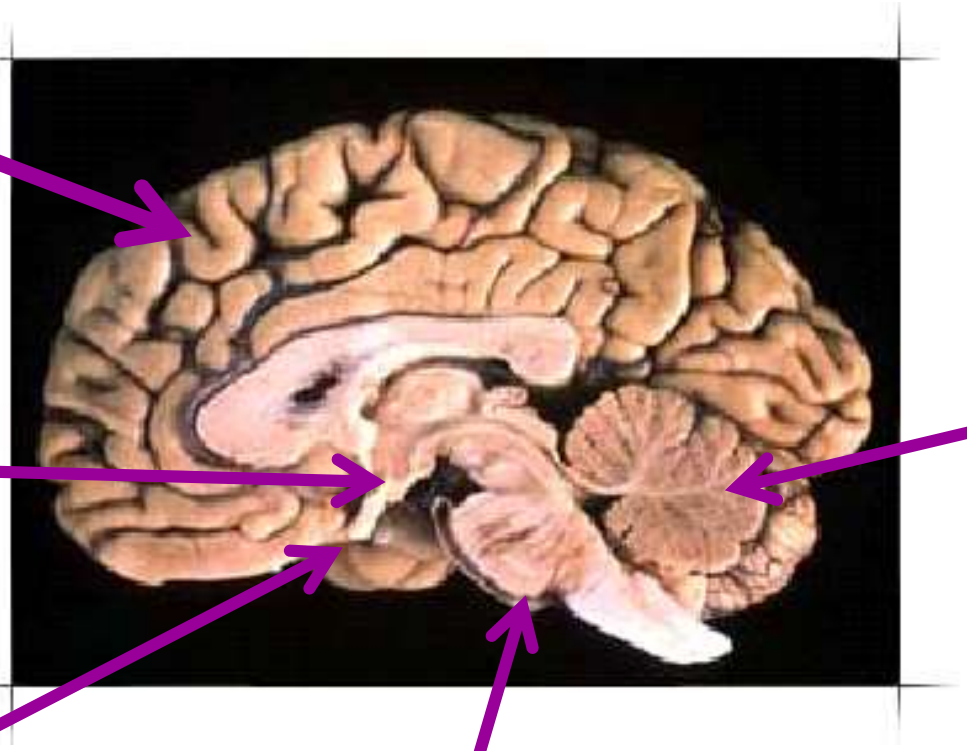


External structure of the brain



Internal structure of the brain

Brain structure



Cerebrum

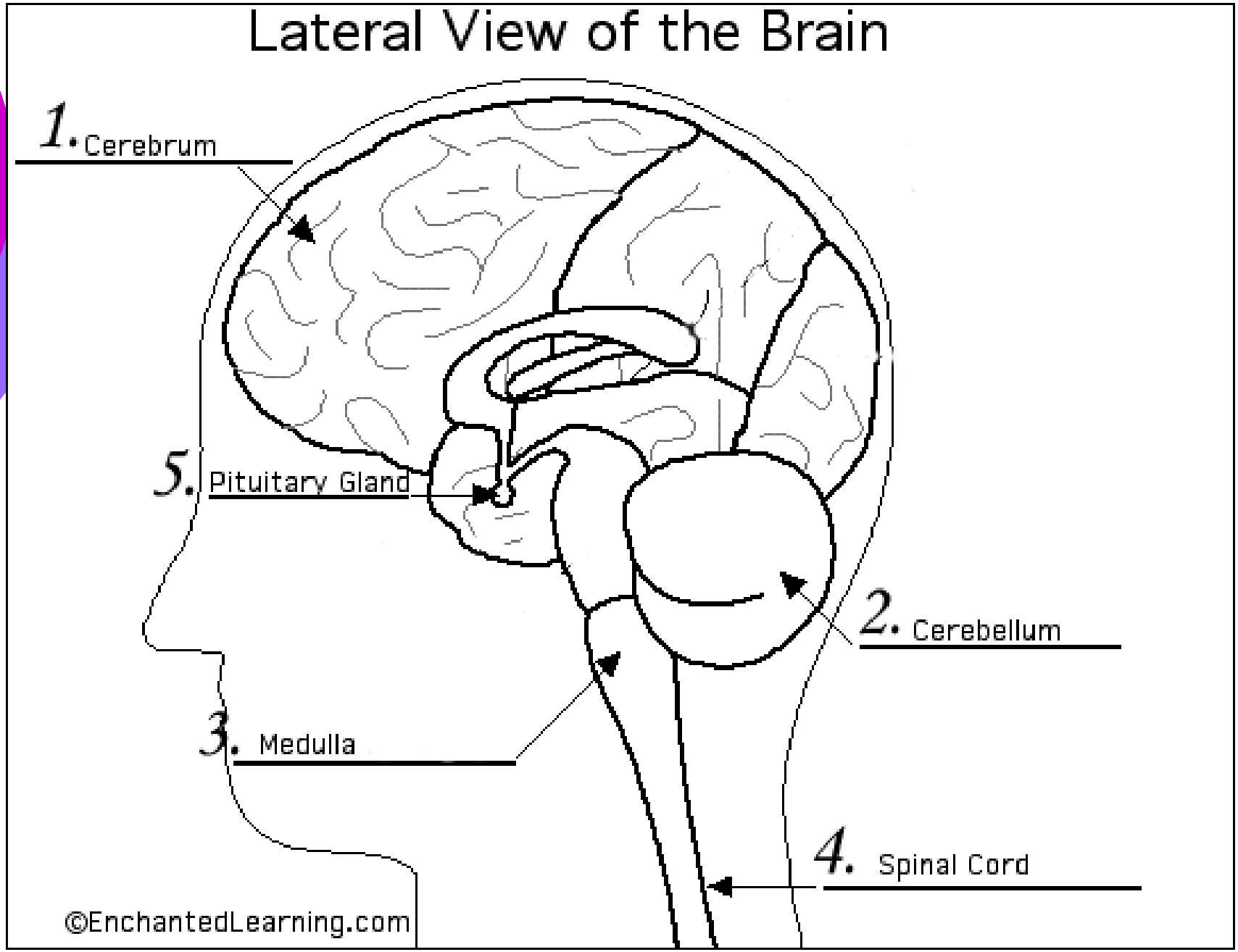
Hypothalamus

Cerebellum

Pituitary gland

Medulla Oblongata

brain functions


Lateral View of the Brain
1. Cerebrum
5. Pituitary Gland
2. Cerebellum
3. Medulla
4. Spinal Cord
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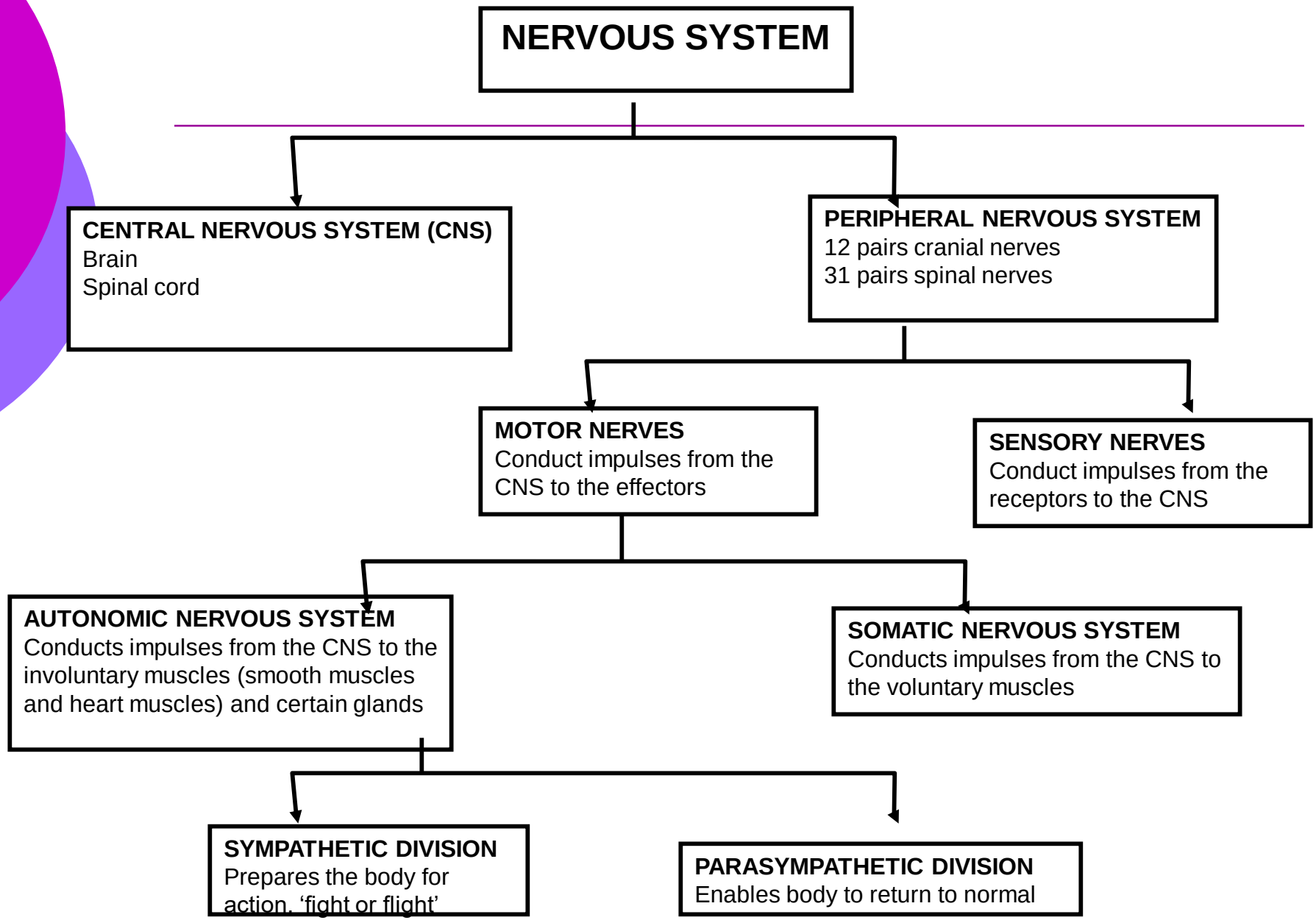
The Brain

ACTIVITY

- Describe the structure and function of the brain
- State the function and location of cerebrum, cerebellum, medulla and hypothalamus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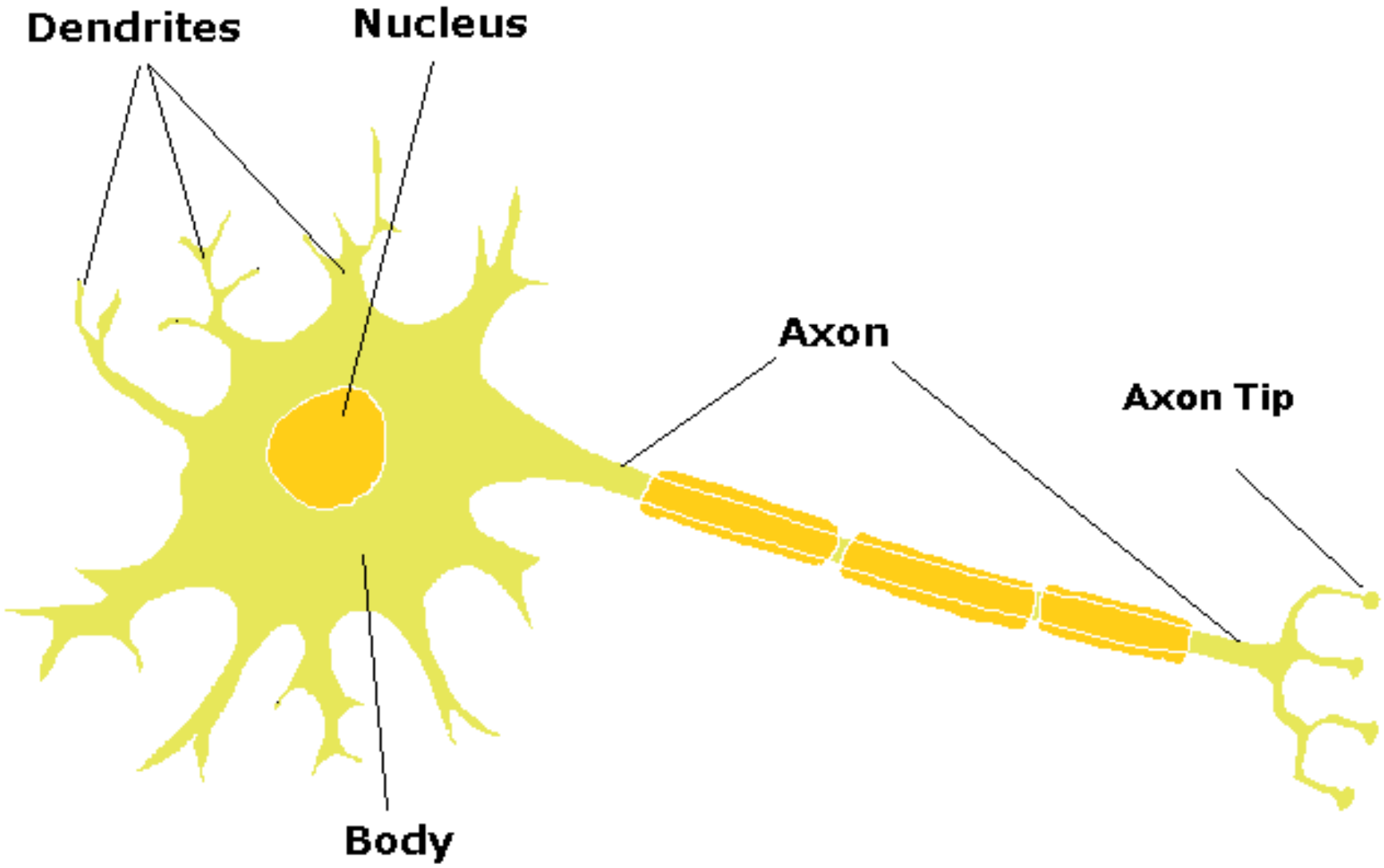
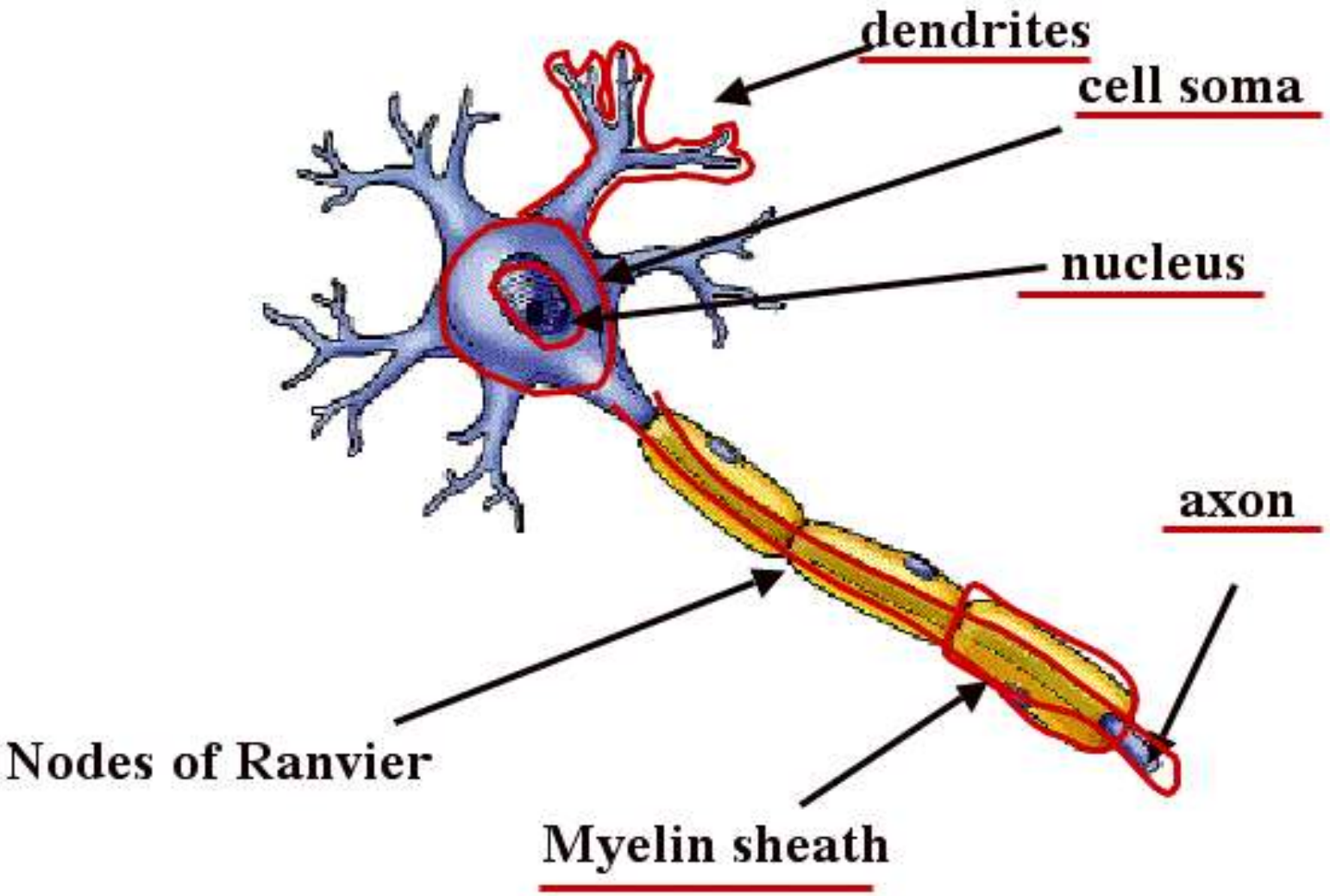
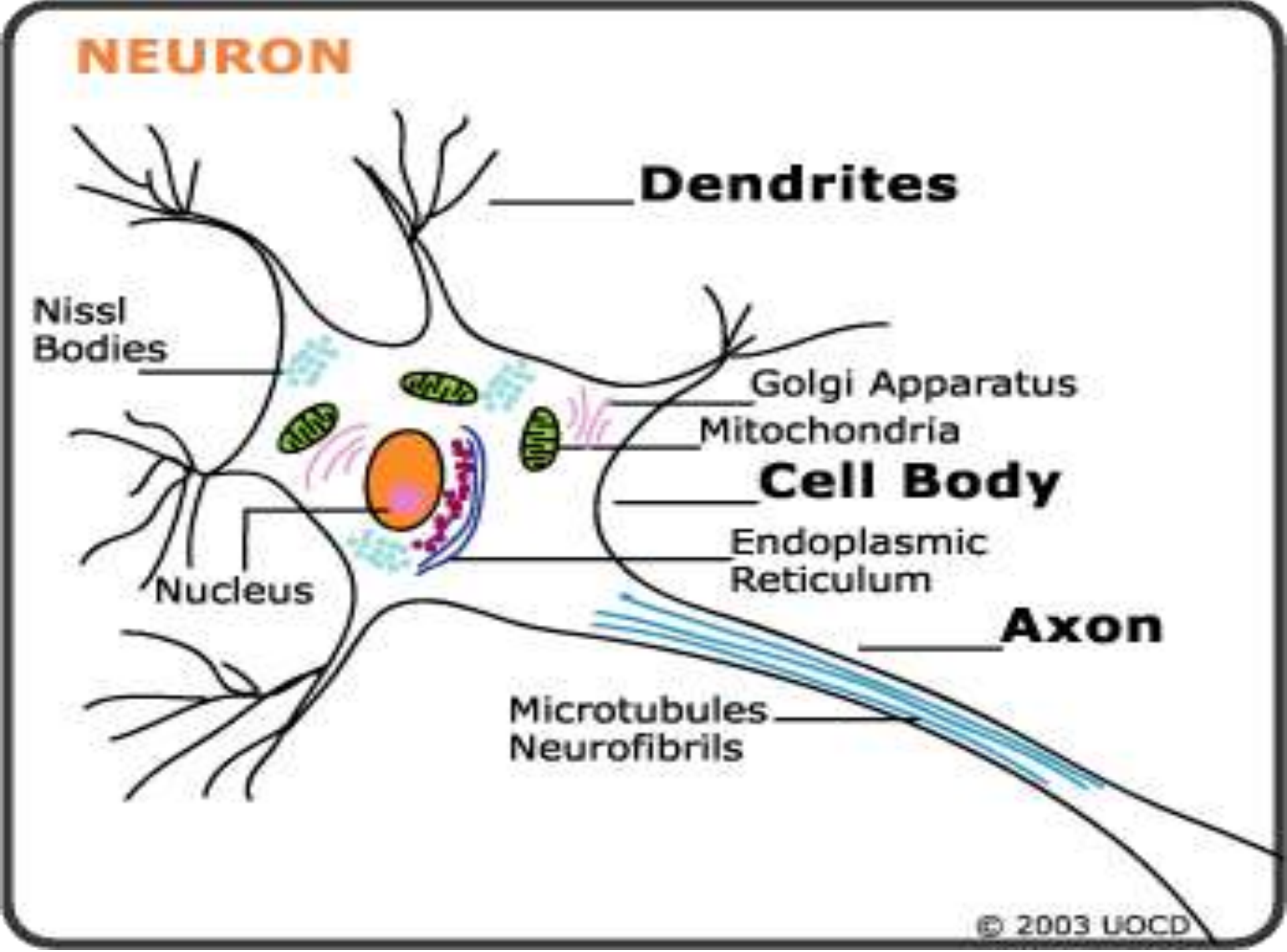
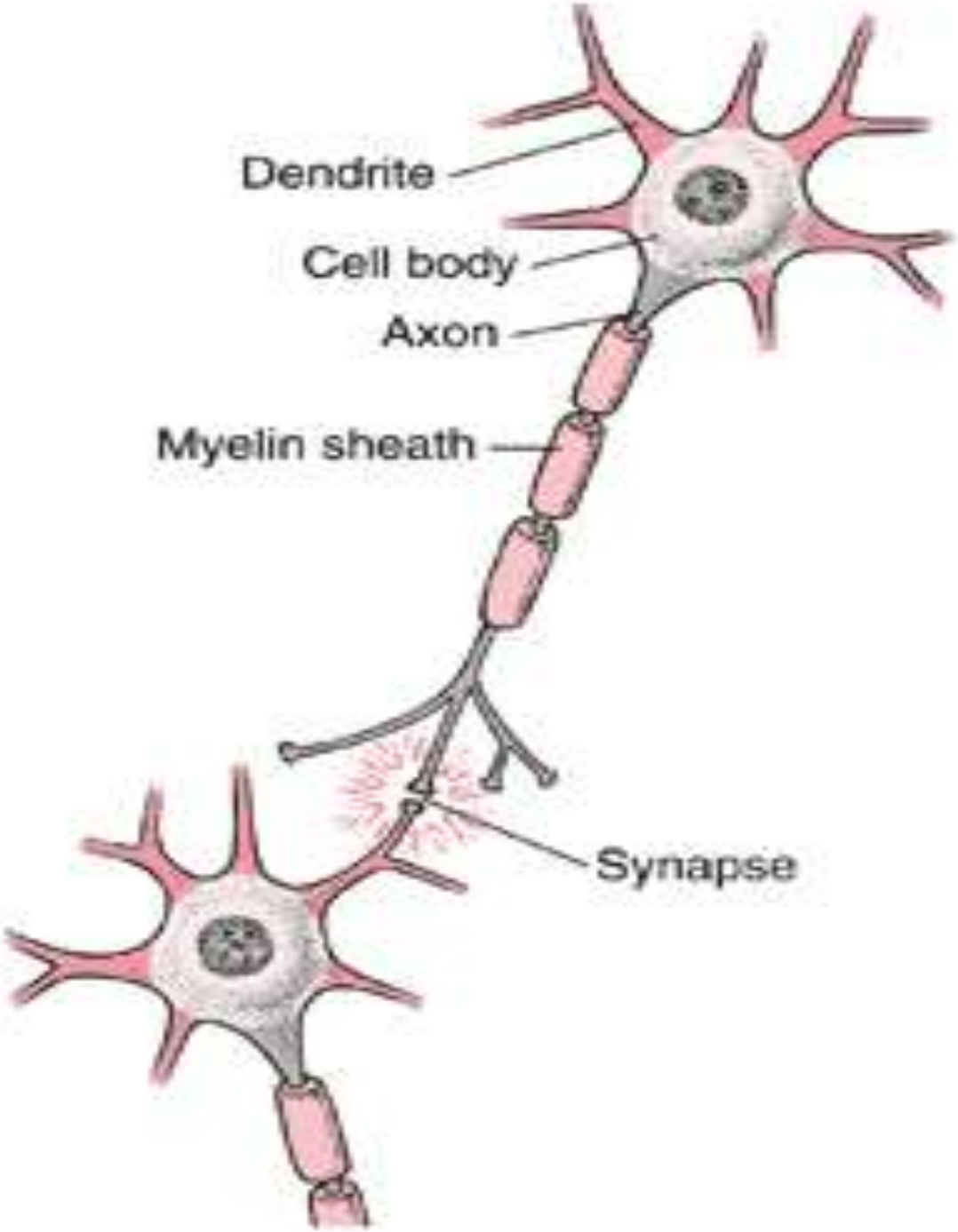
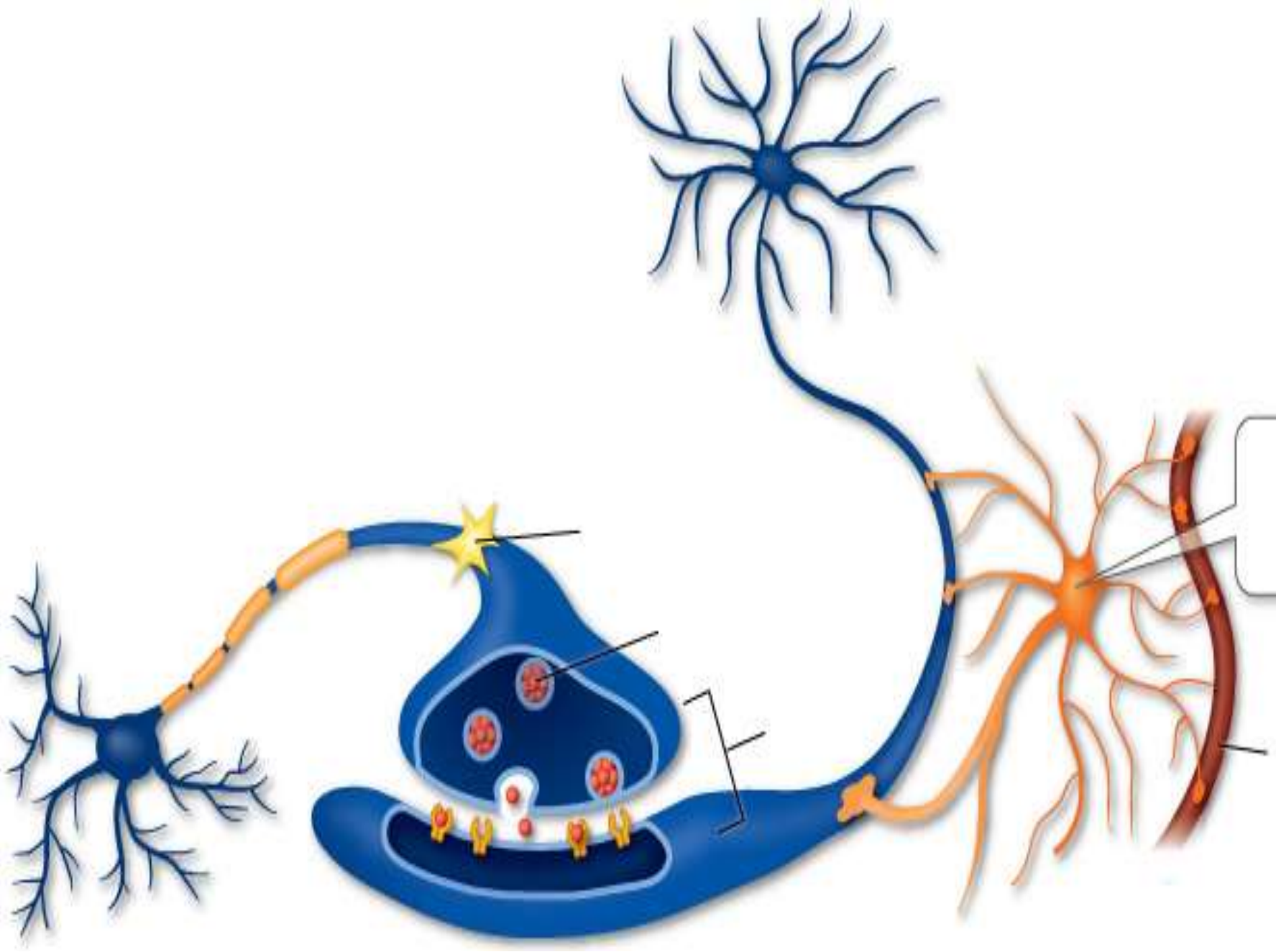

Dendrites
Nucleus
Axon
Axon Tip
Body

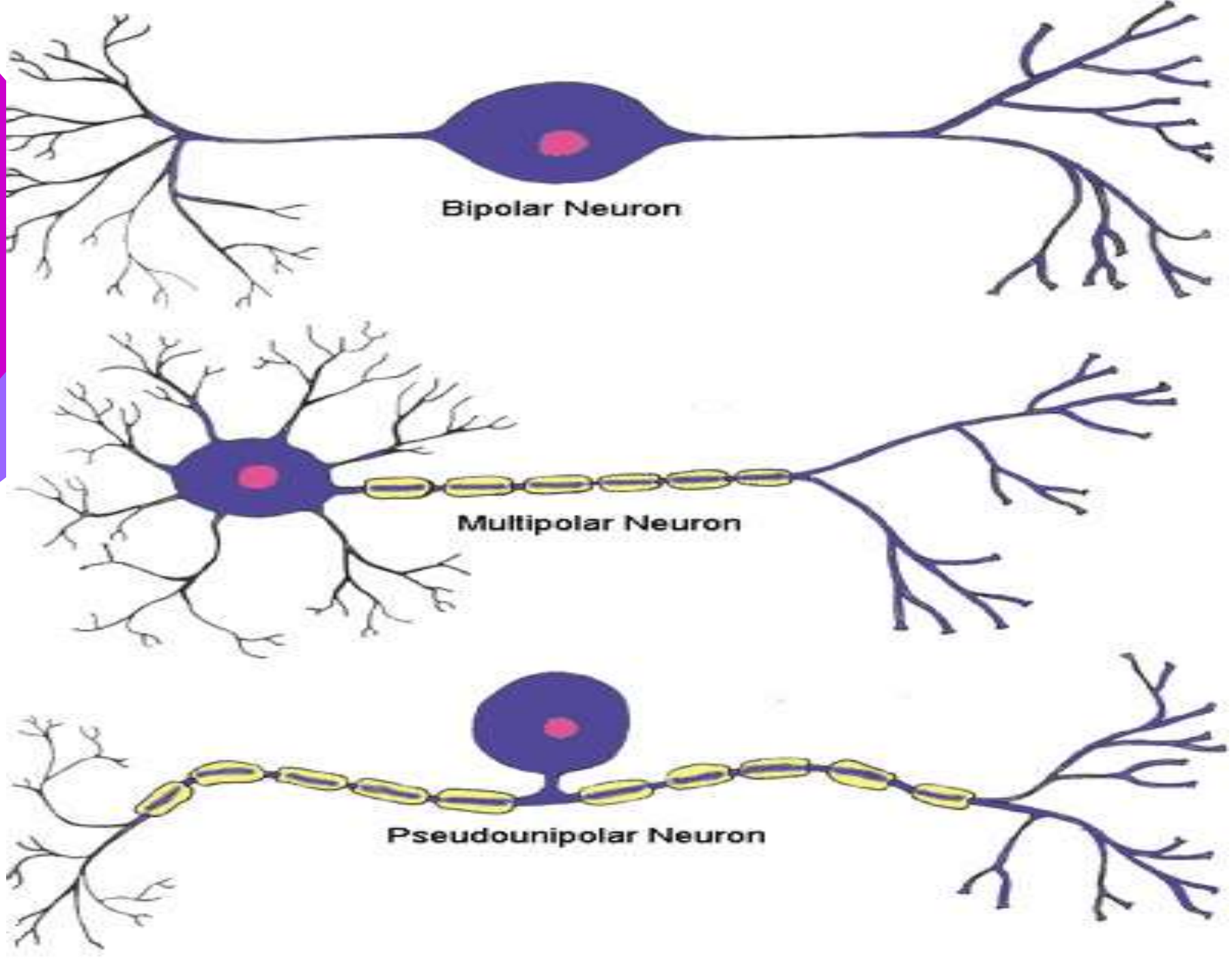
Neuron general structure

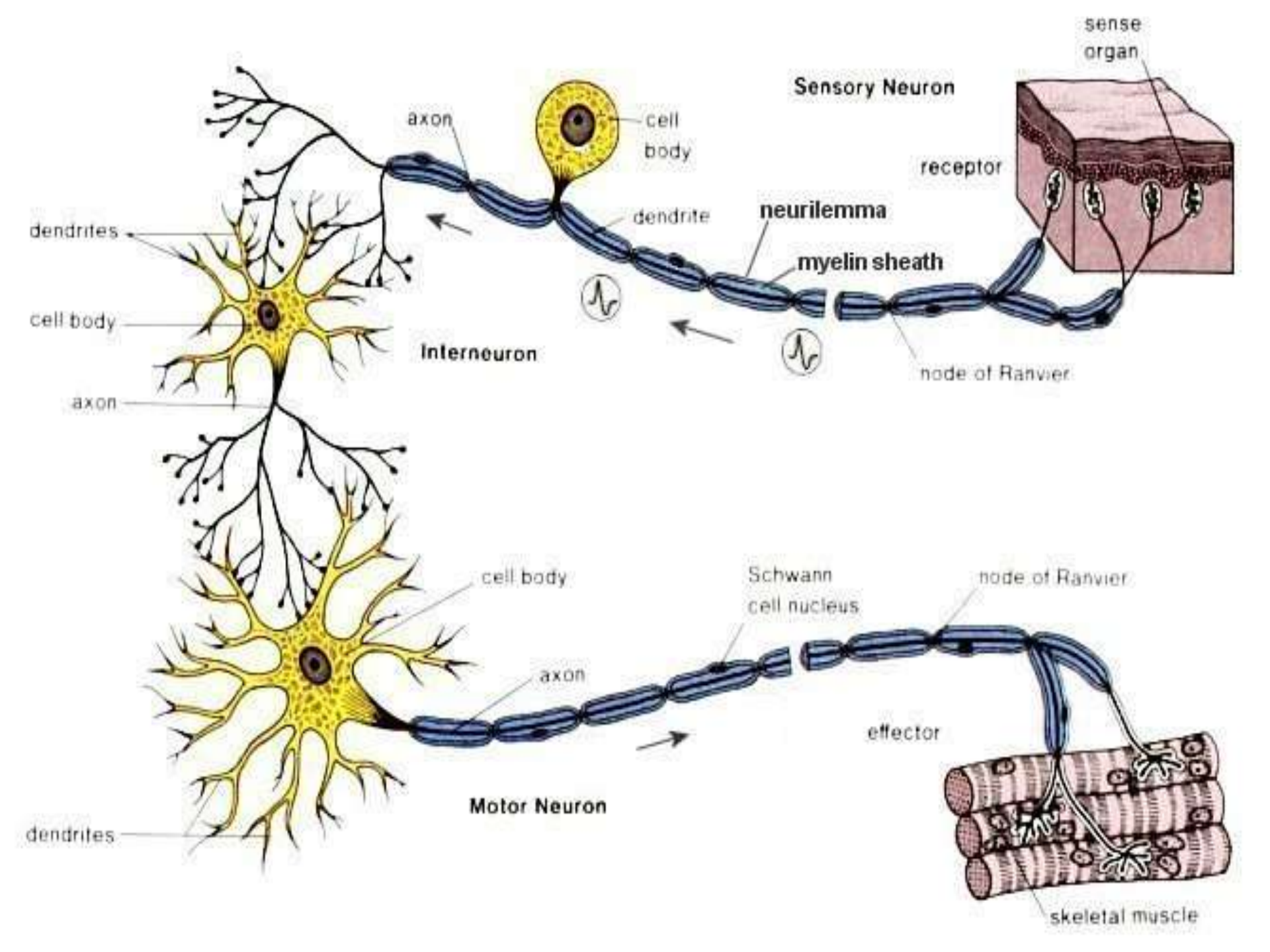



NEURON
Dendrites
Nissl Bodies
Golgi Apparatus
Mitochondria
Cell Body
Endoplasmic Reticulum
Nucleus
Axon
Microtubules
Neurofibrils
© 2003 UOCD

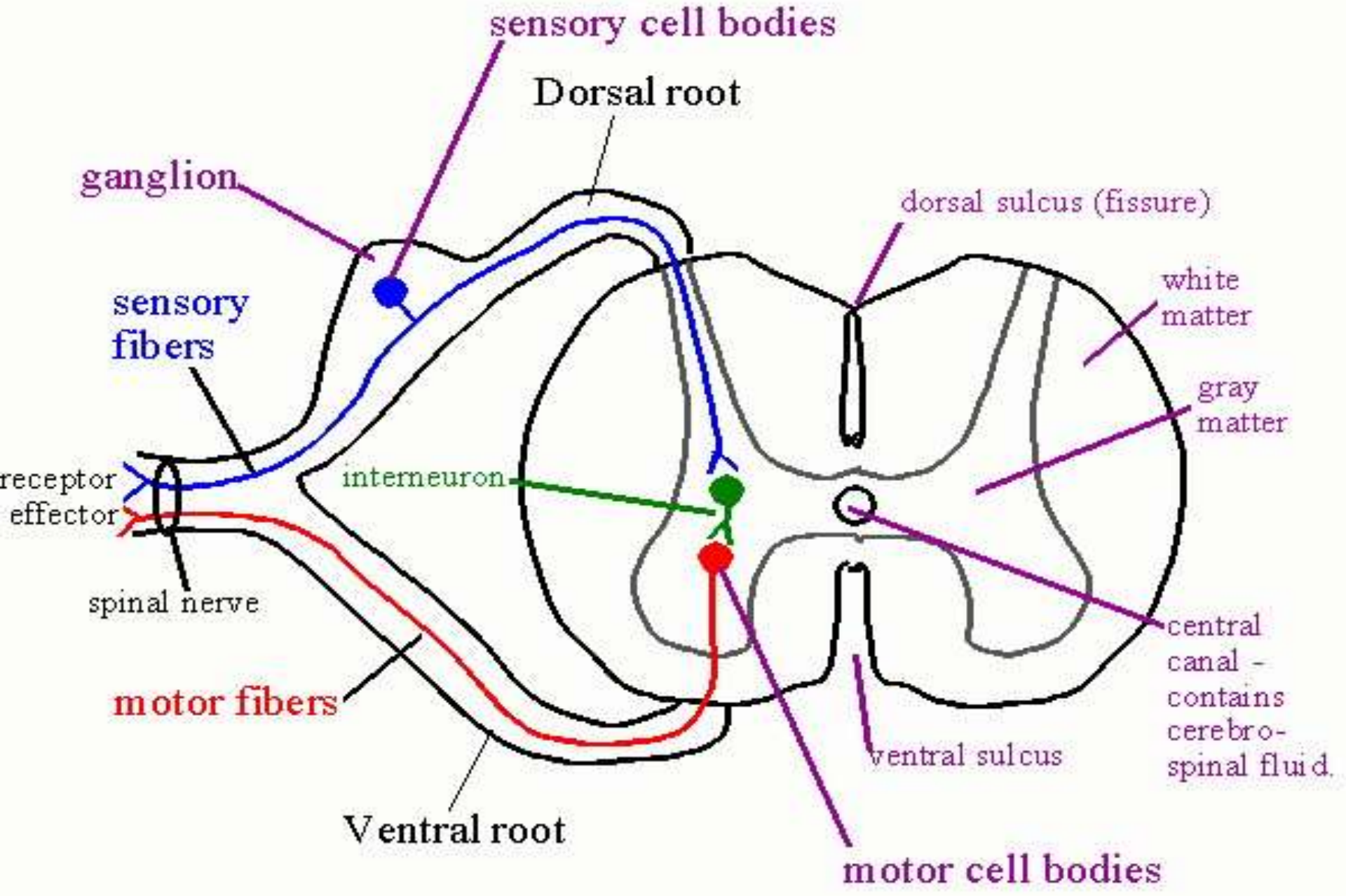

Dendrite
Cell body
Axon
Myelin sheath
Synapse




Bipolar Neuron
Multipolar Neuron
Pseudounipolar Neuron


sense organ
Sensory Neuron
axon
cell body
receptor
dendrite
neurilemma
dendrites
myelin sheath
cell body
Interneuron
axon
node of Ranvier
cell body
Schwann cell nucleus
node of Ranvier
axon
effector
Motor Neuron
dendrites
skeletal muscle

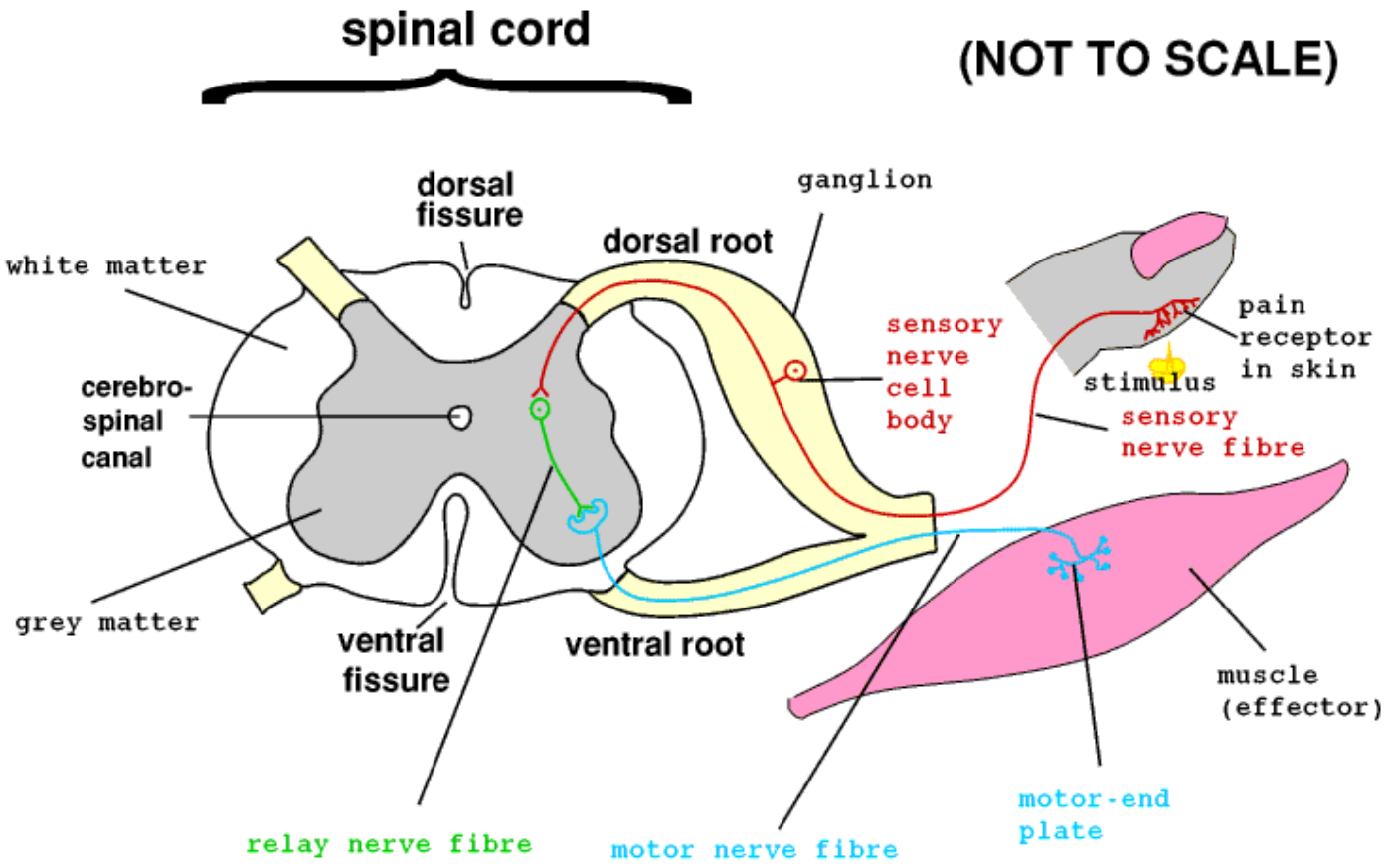
Spinal Cord - Neuron Relationships



A reflex arc

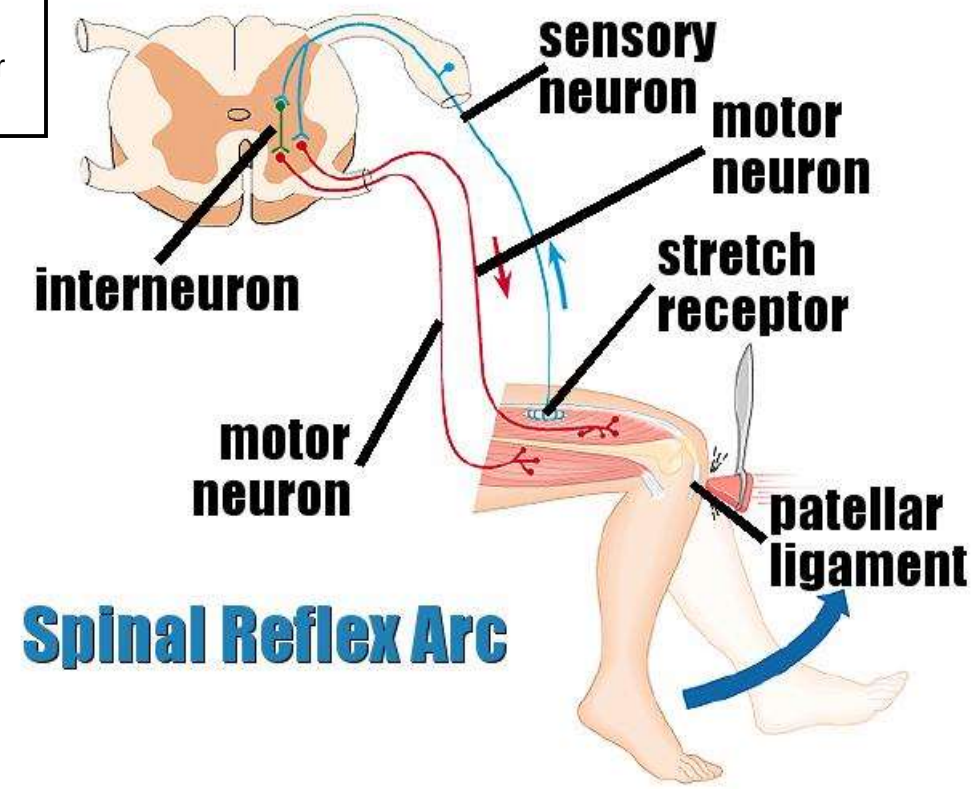
- **The nerve pathway taken in a reflex action is called a reflex arc.**
- **The nervous message goes to the spinal cord, then a message passes from the spinal cord directly to an effector to give an immediate response.**

A reflex arc

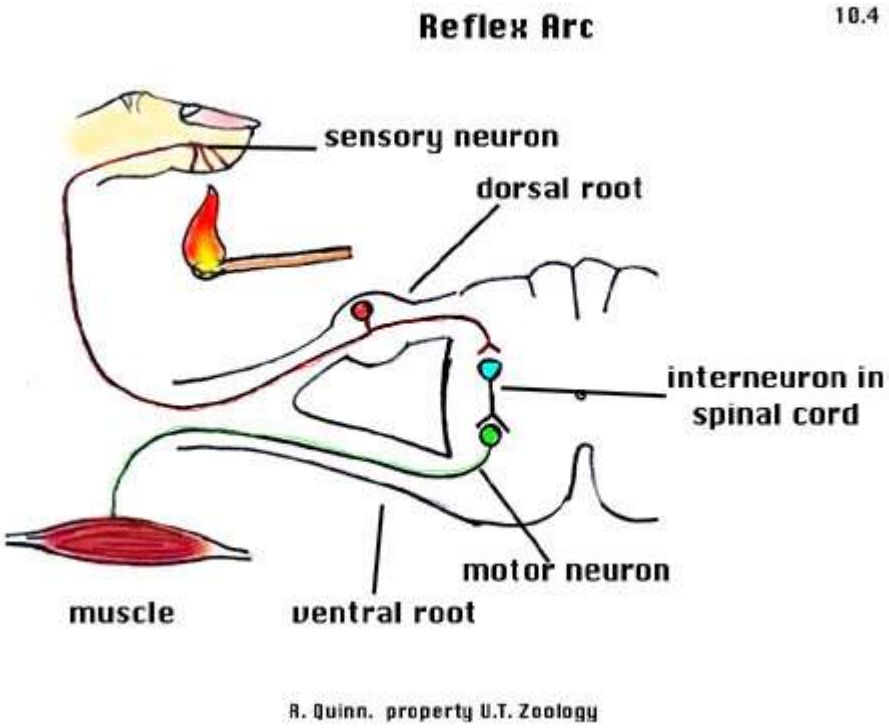

spinal cord
(NOT TO SCALE)
dorsal fissure
ganglion
dorsal root
white matter
cerebro-spinal canal
sensory nerve cell body
pain receptor in skin
stimulus
sensory nerve fibre
grey matter
ventral fissure
ventral root
muscle (effector)
motor-end plate
relay nerve fibre
motor nerve fibre

The knee jerk reflex action

Sometimes called a relay or Connector neurone



Another reflex action



Examples of responses

Voluntary actions

- Eating a cake
- Riding a bicycle
- Walking
- Playing the piano
- Coming to school

Involuntary actions

- Your heart beat
- Breathing
- Removing hand from hot object
- Choking
- Salivating
- Blinking

AUTONOMIC NERVOUS SYSTEM

- The autonomic nervous system HAS two branches.
- The sympathetic branch prepares the body for energy-expending, stressful, or emergency situations.
- The parasympathetic branch is active under ordinary, restful conditions

Sympathetic branch	Parasympathetic branch
1. Increases heart rate	1. Decreases heart rate
2. Relaxes walls of bladder	2. Contracts wall of bladder
3. Dilates pupils	3. Constricts pupils
4. Constricts many arteries	4. Dilates arteries
5. Increases blood pressure	5. Decreases blood pressure