Biology 30 IB
Nervous System

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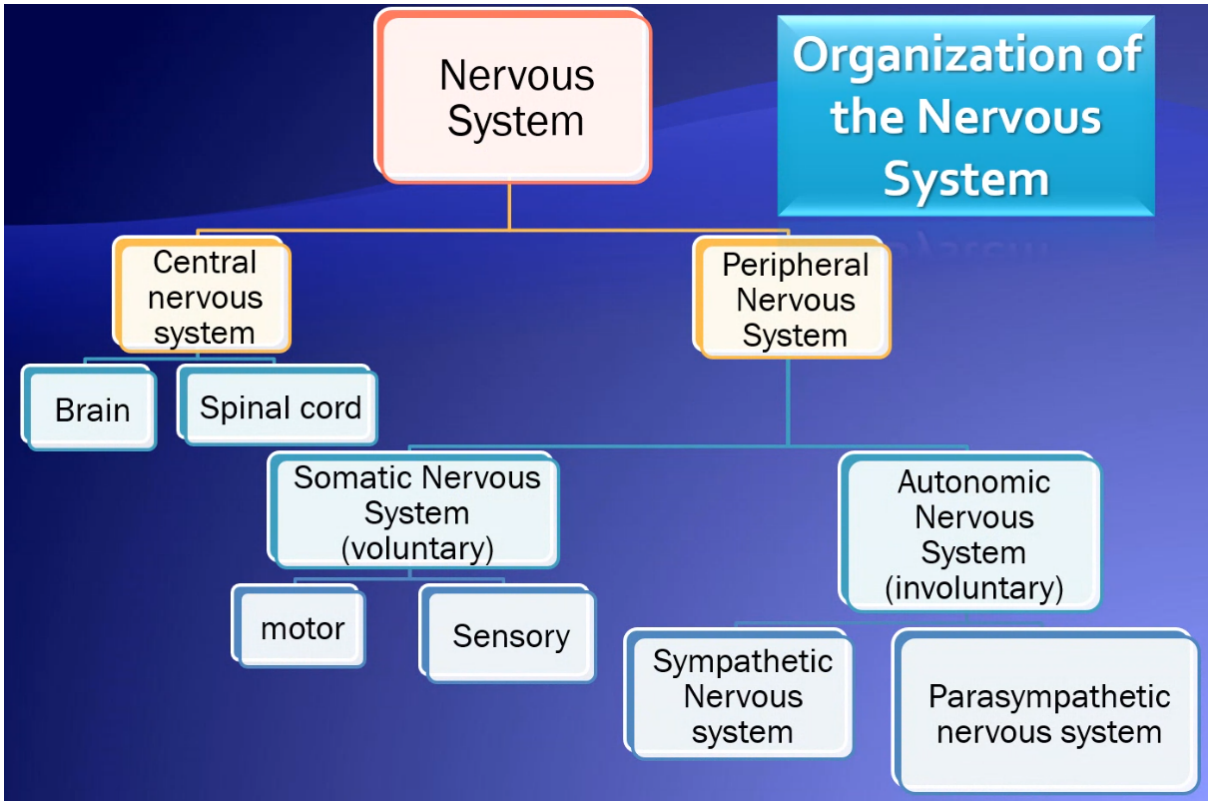
Unfinished!

Contents

(13.1) The Nervous System

- **Equilibrium/Homeostasis** = balance, main job of nervous system is to maintain this
- Nervous system contains...
  - Brain
  - Spinal cord
  - Nerves

Divisions of the Nervous System



Central Nervous System (CNS)

- Integrates and processes information
- Consists of brain and spinal cord

Peripheral Nervous System (PNS)

- Messenger nerves; bring info to and from the central nervous system
- Each include two types of neurons...
  - **Sensory receptors** = carry sensory info to the CNS

- **Motor neurons** = voluntary motor/muscle control, carry signals from the CNS to the skeletal muscles

Somatic Nervous System (SNS)

- Voluntary control
- Somatic sensory neurons gather info from external stimuli — five senses
- Somatic motor neurons control voluntary skeletal muscles

Autonomic Nervous System (ANS)

- Divisions of automatic nerves that are antagonistic/oppose each other
- Regulates involuntary control processes (automatic), such as breathing and heartbeat
- Autonomic sensory neurons gather info from internal stimuli — involved with blood pressure and heart rate
- Autonomic motor neurons control glandular secretions and the function of smooth and cardiac muscles

Sympathetic Nervous System

- "Fight or flight (or freeze)" responses
- Prioritizes urgent functions, such as by speeding up rates of breathing, heart rate, etc.
- Disables non-urgent functions, such as digesting

Parasympathetic Nervous System

- "Rest and digest" responses
- Restores normal priorities restored, slows down rates of breathing, heart rate, etc.
- Re-enables non-urgent functions, such as digesting

Cells of the Nervous System

Neurons

Functional units of nervous system, tissues of neurons are called **nerves**.

- Respond to physical and chemical stimuli
- Conduct electrochemical signals
- Release chemicals that regulate various body processes

Types of Neurons

- **Sensory receptors** = recieves info from 5 senses; bulb-like, end part of sensory neuron
- **Sensory neurons** = gather info from sensory receptors, transmits to CNS
- **Interneurons** = only in CNS; link between sensory and motor neurons
- **Motor neurons** = transmt info from CNS to effectors
- **Effectors** = muscles, glands, other organs

Glial Cells

Supporting cells of nerve cells.

- Nourish neurons, remove wastes, & defend against infection
- Provide a supporting framework for all nervous-system tissue

Neuron Anatomy

Dendrites

- Short, branching terminals of neuron
- Recieve information from...
  - other neurons
  - senses (making it a **sensory receptor**)

Cell Body

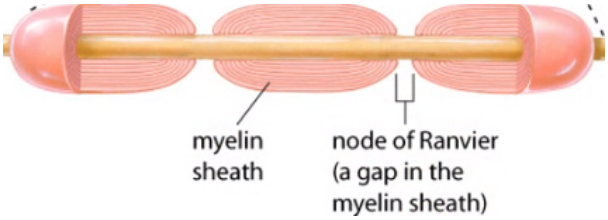
- Site of metabolic reactions
- Contains a nucleus to process info from dendrites
- Makes a decision

Axon

- Thread-like component of neuron after cell body

- Conducts impulses away from the cell body
- Axon terminals = axon ends branch into many fibres

Myelin Sheath



- Insulation on neurons; not all neurons have myelin sheath
- Prevents loss of charged ions

Schwann Cells

- Glial cells wrapping around axon; wrapped form = myelin sheath
- **White matter** = myelinated/insulated neurons; slower than grey
- **Grey matter** = unmyelinated/exposed neurons; common on brain surface

Node of Ranvier

- Gap between myelin sheaths
- Nerve impulses "jump" from node to node, speeding up movement
- **Neurilemma**
  - promotes the regeneration of damaged axons
  - some, not all, schwann cells form this additional layer over the myelin sheath
  - not present in unmyelianted, grey matter of CNS

Repairing Damage Nerves

Stem Cells

- Unspecialized cells
- Can be used to repair all sorts of injuries

Reflex Arc

- Prevents injury before even being consciously aware of a threat
- **Reflexes** = sudden, unlearned, and involuntary responses to certain stimuli
- **Spinal Reflex**

- Reflex with no brain involvement during threat
- Decision to reflex made by interneuron
- Interneuron communicates to brain after threat
- Occurs for spinal reflexes AND conditional reflexes (e.g. touching something hot)
- Stimulus
  $\longrightarrow$ Sensory Receptor (dendrite) $\longrightarrow$ Sensory Neuron $\longrightarrow$ Interneuron (in spine)
  $\longrightarrow$ Motor Neuron $\longrightarrow$ Effector Organ $\longrightarrow$ Response