Major Divisions of the Nervous System
Central nervous system (CNS) – brain, spinal cord
Peripheral nervous system (PNS) – cranial nerves, spinal nerves
Somatic nervous system (SNS) – skeletal muscle, voluntary
Autonomic nervous system (ANS) – smooth and cardiac muscle, glands, involuntary
Sympathetic division
Parasympathetic division
Afferent (sensory) neurons – transmit nerve impulses to CNS
Efferent (motor) neurons – transmit nerve impulses away from CNS
Association (interneuron) neurons – carry nerve impulses entirely within CNS

Neuron Anatomy
Cell body
Nucleus
Dendrite
Axon
Axon collaterals
Axon hillock
Axon terminal
Terminal knob
Presynaptic membrane
Synaptic cleft
Postsynaptic membrane
Schwann cell
Myelin sheath
Node of Ranvier
Synaptic vesicle
Receptor
Neurotransmitter
Sodium-potassium pump
Chemical-gated channel
Voltage-gated channel

Neuron Physiology
Action potential
Axonal transport
Depolarization
Innervation
Nerve impulse
Polarization
Propagation (conduction)
Resting membrane potential (RMP)
Summation
Threshold

Principal Types of Cells
- Neurons – carry nerve impulses
- Neuroglial (glia) cells – support neurons. There are 10-50 times the amount of glial cells than neurons

Types of Neuroglia
In Central Nervous System
1. Astrocytes – support and maintain neurons, and attach them to blood vessels
2. Oligodendrocyte – support neurons and produce a myelin sheath around their axons
3. Microglia – CNS macrophages
4. Ependymal cells – line ventricles of CNS

In Peripheral Nervous System
1. Satellite cells – support neurons in ganglia of PNS
2. Schwann cells (neurolemmocytes) – wrap themselves as a myelin sheath around axons and help with rapidity of nerve impulse and regeneration of injured axon

Other Terminology
Adrenergic Neuromodulator
Agonist Neuropeptide
Antagonist Neuropharmacology
Anticholinergic Nicotinic receptor
Brain Cerebrospinal fluid
Cerebrospinal fluid Cholinergic
Dermatomes Nociceptors
Enzyme Reuptake
Ganglia Secondary messenger
Muscarinic receptor Tolerance

Major Neurotransmitters
Type A Small-Molecule Rapidly Acting Transmitters
Class I
* Acetylcholine – widely used; generally excitatory but occasionally inhibitory as with the vagus nerve and the heart

Class II: The amines
* Catecholamines – derived from tyrosine
  Dopamine – generally inhibitory
  Norepinephrine (noradrenaline) (NE) – widely used; excitatory and inhibitory
  Epinephrine (adrenaline) (E)
* Serotonin – 5 hydroxytryptamine (5-HT) – derived from tryptophan; found in the brain (as a neurotransmitter) and spinal cord. Affects mood, pain, sleep and sensory perception
* Histamine – derived from histidine; acts as a neurotransmitter in the brain

Class III: Amino acids
* Gamma-Aminobutyric Acid (GABA) – found primarily in the brain and spinal cord; primary inhibitory neurotransmitter in the brain
* Glycine – found primarily in the spinal cord where it is the major inhibitory neurotransmitter
* Glutamate – primary excitatory neurotransmitter in the brain
* Aspartate – excitatory neurotransmitter in the brain
Class IV

Nitric oxide (NO) – a neurotransmitter and neuromodulator in the brain. A gas.

Type B A few Neuropeptides: slower acting neurotransmitters

Opiate Peptides – widely found in the brain and are inhibitory

β Endorphin

Enkephalins

Dynorphins

Gut-brain Peptides – found in both brain and intestine

Substance P – found widely in the body; a slowly released pain transmitter

Vasoactive intestinal polypeptide (VIP) – excitatory neurotransmitter and modulator in the brain. Broad action in the GI tract as a hormone

Cholecystokinin (CCK)

Neurotensin (NT)

Insulin

Categories of Therapeutics

Adaptogen – helps the body adapt to stress

Analeptic – increases activity of the central nervous system

Analgesic – relieves pain

Anesthetic – produces a partial or complete loss of nerve sensation

Anticholinergic – inhibits the impulses of acetylcholine

Anticonvulsant – preventing or reducing the severity of epilepsy or other seizures

Antidepressant – helps prevent or alleviate depression

Antispasmodic – relieves smooth muscle spasms

Antistress – reduces stressful feelings or actions

Anxiolytic – reduces anxiety or nervousness

Calmative – promotes a feeling of calm, relaxation

Excitant – agent eliciting excitation of specific body functions, i.e. Cerebral or motor

Hypnotic – induces sleep

Narcotic – producing sleep or stupor, or an opium derived drug

Nervine – nourishes and treats nervous system related disorders

Psychotropic – affecting psychic function, i.e. Behavior and experience

Relaxant – reduces tension

Restorative – general term for agents that help regain strength and health

Sedative – increases rate of activity of a body system

Skeletal muscle relaxant – relaxes muscles of the musculo-skeletal system

Soporific – produces a deep sleep
**Disorders**
- Affective (mood) disorders
- Alzheimer syndrome
- Anxiety
- Aphasia
- Attention deficit disorder (ADD)
- Bipolar (manic depressive) disorder
- Caffeinism
- Cognitive deficiency
- Dementia
- Depression
- Digestive disorders
- Dyslexia
- Epilepsy
- Headache
- Insomnia
- Attention deficit disorder (ADD)
- Epilepsy
- Headache
- Insomnia

**Drugs and Drug Therapies**
- Anticholinergics
- Antipsychotics
- Benzodiazepines
- L-Dopa
- Lithium

**Considerations**
- Alcohol
- Anxiety
- Breathe
- Caffeine
- Diet
- Drug use

**Central Nervous System**
(CNS) Brain Spinal Cord

**Autonomic Nervous System**
(CNS) Brain Spinal Cord

**Somatic Nervous System**
(CNS) Brain Spinal Cord

**Sympathetic Nervous System**
(CNS) Brain Spinal Cord

**Parasympathetic Nervous System**
(CNS) Brain Spinal Cord
Herbs

American ginseng – Panax quinquefolius
Ayahuasca – Banisteriopsis caapi/B. spp.
Belladonna – Atropa belladonna
Black cohosh – Cimicifuga racemosa
Blue vervain – Verbena hastata
Bugleweed – Lycopus spp.
Calamus – Acorus calamus
California poppy – Eschscholtzia spp.
Coca – Erythroxylum coca
Coffee – Coffea arabica/ C. spp
Cola – Cola acuminata/C. nitida
Corydalis – Corydalis aurea
Coyote weed – Thamnosma texana
Damiana – Turnera diffusa/T. spp
Dicentra – Dicentra canadensis/D. spp.
Epipactis – Epipactis helleborine
German chamomile – Matricaria recutita
Ginger – Zingiber officinale
Gingko – Gingko biloba
Gotu kola – Centella asiatica
Guarana – Paullinia cupana
Henbane – Hyoscyamus niger
Hops – Humulus lupulus
Jamaican dogwood – Piscidia piscipula
Jimsonweed – Datura stramonium/D. spp
Kava kava – Piper methysticum
Khat – Catha edulis
Lemon balm – Melissa officinalis
Lavender – Lavandula spp.
Linden – Tilia europaea

Lobelia – Lobelia inflata
Marijuana – Cannabis sativa
Mistletoe – Viscum album
Monkshood – Aconitum columbianum
Motherwort – Leonurus cardiaca
Mountain laurel – Kalmia latifolia
Nux vomica – Strychnos nux-vomica
Oats – Avena sativa/A. spp.
Passionflower – Passiflora incarnata
Peppermint – Mentha piperita
Peyote – Lophophora williamsii
Poison hemlock – Conium maculatum
Poppies – Papaver somniferum
Pulsatilla – Anemone pulsatilla/A. spp.
Rauwolfia – Rauwolfia serpentina
Rosemary – Rosmarinus spp.
St. Johnswort – Hypericum perforatum
Siberian ginseng – Eleutherococcus senticosus
Skullcap – Scutellaria lateriflora/S. spp.
Syrian rue – Peganum harmala
Tea – Camellia (Thea) sinensis
Tobacco – Nicotiana tabacum/N. rustica
Valerian – Valeriana officinalis/V. spp.
Vervain – Verbena officinalis
Wild lettuce – Lactuca spp.
Wood betony – Stachys officinalis
Yellow jessamine – Gelsemium sempervirens
Yerba mate – Ilex paraguariensis
Yohimbe – Corynanthe yohimbe