Test II Review

Ion Channels

* Understand relative intracellular and extracellular concentrations of sodium, potassium, calcium, and chloride ions
* Describe what an ion channel is and the molecular properties that form these channels
* Describe voltage-gated and ligand-gated ion channels
* Understand and explain how sodium ion channels and potassium ion channels work

Thermodynamics of Ion Channels and Sodium/Potassium/ATP pumps

* Ion concentration gradients
* Cell membrane electric potentials
* Nernst equation and membrane equilibrium potentials
* Ion movements and resulting inhibitory/excitatory potential changes
* Sodium-potassium-ATP pump mechanism and energetics associated with this
* Free energy changes of ion movement across voltage and concentration gradients
* Second Law of Thermodynamics to predict ion movement spontaneity

G-Protein Coupled Receptors (GPCRs)

* Structure
* Detailed mechanism of action of GPCRs
* Relevance in pharmaceutical industry
* Systems of neuroreceptors that are GPCRs

Cholinergics

* Acetylcholine structure and mechanism for synthesis and hydrolysis
* Steps that occur to pass a nerve impulse from one neuron to another
* Mechanism of action for botulinum toxin
* Two major mechanisms used to reduce neurotransmitter levels at nerve synapses
* Two major classes of cholinergic receptors and the specific mechanism of action for each
* Cholinergic antagonists
* Acetylcholinesterase inhibitors
* Structure and mechanism of catalytic triad at acetylcholinesterase active site

Adrenergics

* Schematic of peripheral nervous system
* Structure of epinephrine, norepinephrine, pseudoephedrine
* Geometry of adrenergic receptors
* Major classes and roles of norepinephrine receptors
* Interaction diagram of adrenergic receptors with neurotransmitters at binding site
* MOA of activated receptors
* Decomposition via monoamine oxidase enzyme
* Medications that target adrenergic receptors and their mechanism of action
* Beta-blockers, asthma medications, local anesthetics, decongestants

Psychoactive Drugs: Stimulants

* Structures of amphetamine, methamphetamine, pseudoephedrine
* History of cocaine and amphetamines
* Mechanism of action for stimulants
* Current and historical use of amphetamines and cocaine

Psychoactive Drugs: Tranquilizers

* Structure of ethanol, GABA, GHB
* Mechanism of action of benzodiazepenes, ethanol, barbituates, sedative hypnotics
* Use in this country
* Toxic and adverse effects

Psychoactive Drugs: Anti-Depressants

* Structures of dopamine, norepinephrine, serotonin
* Prevalence of depression
* Monoamine theory of depression
* Mechanisms of actions of four classes of anti-depressants
  + MAO Inhibitors
  + Tricyclic Antidepressants (TCAs)
  + Selective Serotonin Reuptake inhibitors (SSRIs)
  + Serotonin Norepinephrine Reuptake inhibitors (SNRIs)
* Toxicity and side effects of anti-depressant medications

Psychoactive Drugs: Anti-Psychotics

* Symptoms of Schizophrenia and frequency of occurrence
* Historical discovery of substances to treat schizophrenia
* Dopamine theory of schizophrenia
* Mechanism of action of anti-psychotic medications
* Side-effects of schizophrenia medications
* Amphetamines, Parkinson medications, and schizophrenia symptoms
* Atypical anti-psychotics: development and mechanisms of action
* Effect of PCP and ketamine on NMDA receptors
* Glutamate neural activity and schizophrenia

Psychoactive Drugs: Opiates and Opioids

* Natural sources of opiates and evolutionary theories for prevalence
* History of opioid use and development by humans
* Effects of opiates and opioids on humans
* Historical discovery and marketing of heroin and aspririn
* Opioid general structure
* Mechanism of action for and  opioid receptors respectively
* Endogeneous opioids
* Oxycodone medications and societal issues

Local and General Anesthetics

* Mechanism of action for local anesthetics
* Relationship of pKa to local anesthetic
* Mechanism of action for general anesthetics
* Commonly used general anesthetics