

## Human Physiology - Exam 2 Study Guide

### Receptors and Signal Transduction

What determines a cell's response to a message?

What is signal transduction?

Second messengers: what are they? Examples?

Signal transduction pathways: cascades and amplifications

Compare tyrosine kinase and G protein-coupled receptors (GPCRs)

### Endocrinology

What is a hormone?

Comparison: endocrine system vs. nervous system:

Hormone synthesis, storage, transport, half-life, release and mechanism of action for each of the three classes of hormones (peptides, steroids, amines (catecholamines and thyroid hormones))

Control of hormone release: trophic hormones, simple endocrine reflex pathway, synergism, permissiveness, antagonism

### Membrane Potential

Resting potential of a membrane - what causes it?

Na<sup>+</sup>/K<sup>+</sup> pumps: what do they do? where are they found?

Equilibrium potentials - what are they? what are they based on?

What determines an ion's driving force?

### Introduction to the Nervous System

Divisions of the nervous system

Cell types: neuron, supporting cells

Classification of neurons and nerves based on structure and function

Coding of information: depolarization and hyperpolarization

Action potentials: characteristics, events involved, flow of ions, refractive period, how stimulus intensity is coded, conduction down the axon, etc.

Transmission of an impulse across a synapse: characteristics, events involved, flow of ions, how stimulus intensity is coded, etc.

Ligand-operated channels vs. voltage-operated channels

### The Central Nervous System

Structural organization of the brain

Cerebrum: main functions of each lobe, cerebral lateralization

Physiological basis of language, memory, emotion, motivation (in brief)

Diencephalon: main functions of the thalamus, hypothalamus, pituitary gland

Midbrain, hindbrain basic functions

What is the diffuse modulatory system?

### The Autonomic Nervous System

Compare somatic motor neurons with autonomic neurons

Compare the 2 divisions of the autonomic NS

Sympathetic: where preganglionic neurons originate, organization of ganglia, what it is responsible for, how it functions as a unit

Parasympathetic: where preganglionic neurons originate, what it is responsible for

Cholinergic stimulation response characteristics:

nicotinic vs. muscarinic subtypes (structure, function)

Adrenergic stimulation response characteristics:

alpha vs. beta receptors (what do they do?)

Adrenal sympathetic pathway

Antagonistic vs. cooperative vs. complementary effects of the sympathetic and parasympathetic

### Sensory Physiology

Characteristics and types of sensory receptors

Phasic vs. tonic receptors

What is lateral inhibition and why is it important?

Cutaneous sensations: receptor fields, sensory acuity

Taste: taste buds, structure, types, how stimulated

Olfaction: how routed through brain

Equilibrium and the vestibular apparatus

Hearing: ear anatomy, transduction of mechanical to electrical signals, hearing impairments

Vision: rods vs. cones, transduction of light energy to electrical energy, accommodation, acuity, myopia, hyperopia, astigmatism, retina structure and function, neural processing of visual information

### Muscle Physiology

Skeletal muscle microanatomy

Types of muscle contractions: isotonic, isometric, twitch, summation, tetanus

Mechanisms of contraction and the sliding filament theory

Regulation of contraction and the roles of  $Ca^{++}$

Energy requirements of skeletal muscle (specifically, how is ATP used?)

Excitation / contraction coupling