

CHAPTER 1 – INTRODUCTION TO PHYSIOLOGY

I. Mechanistic vs. Evolutionary Physiology

II. Environmental Influences on Physiology

A. Biotic

1. Predators
2. Food
3. Potential mates

B. Abiotic

1. Temperature
2. Oxygen
3. Water

III. Regulation vs. Conformity

A. Concept of homeostasis

IV. Integration across Levels of Biological Organization

CHAPTER 2 – MOLECULES AND CELLS

I. Enzymes

A. Structure and Function

B. Role in regulation of metabolism

1. gene expression
2. modulation

II. Cell membranes

A. Selective barrier

B. Structural components

1. Phospholipids
 - a. amphipathic
 - b. functional consequences of variation in composition

2. Proteins

- a. functional types

III. Epithelia

A. Physiological barrier

B. Epithelial cell structure

C. How to cross an epithelia?

CHAPTER 4 – MEMBRANE TRANSPORT

I. General concepts

A. Permeability

B. Electrochemical equilibrium

II. Passive transport

A. General characteristics

B. Factors affecting passive movement of solutes (Fick equation)

C. Simple and facilitated diffusion

III. Active transport

A. General characteristics

- B. Electrogenic and non-electrogenic pumps
- C. Primary and secondary active transport
- IV. Osmosis
 - A. General characteristics

CHAPTERS 11 & 14 – THE NERVOUS SYSTEM

I. Nervous vs. Endocrine System

II. Gross morphology of nervous system

A. CNS

- 1. Brain
 - a. forebrain
 - b. midbrain
 - c. hindbrain
- 2. Spinal Cord

B. PNS

- 1. Sensory
- 2. Motor
 - a. Somatic
 - b. Autonomic
 - i. Sympathetic
 - ii. Parasympathetic

III. Neuron Anatomy

- A. Dendrites
- B. Soma
- C. Axon
- D. Support cells

IV. Passive electrical properties of cells

- A. Capacitance (C)
- B. Resistance (R)
- C. Ohm's Law

V. Membrane potential

- A. Factors contributing to resting potential
- B. depolarization and hyperpolarization
- C. Equilibrium potential and Nernst's equation
- D. Membrane potential and Goldman's equation

VI. Excitable cells

- A. Ion channels
 - 1. passive "leak" channels
 - 2. voltage-gated channels
 - 3. ligand-gated channels
- B. Graded potentials
- C. Action potentials
 - 1. Phases
 - 2. Channel activity
 - 3. Hodgkin's cycle

- 4. Propagation
- 5. Refractory period
- 6. Conduction velocity
- D. Pacemaker potentials

CHAPTER 12 – SYNAPSES

I. Electrical Synapses

II. Chemical Synapses

- A. Events in pre-synaptic cells (transduction of electrical to chemical signal)
- B. Events in post-synaptic cells (transduction of chemical to electrical signal)
 - 1. Receptor types
 - a. ionotropic
 - b. metabotropic
 - 2. Post-synaptic potentials
 - a. EPSP
 - b. IPSP
 - 3. Integration and response
- C. Neuromuscular junctions

CHAPTER 13 – SENSORY SYSTEMS

I. General principles

- A. Labeled lines
- B. Transduction of sensory stimuli to electrical signal
- C. Types of sensory stimuli
 - 1. Chemical
 - 2. Mechanical
 - 3. Thermal
 - 4. Electromagnetic

II. Case studies

- A. Vomeronasal in snakes (chemoreception)
- B. Lateral lines in fish (mechanoreception)