

## Human Physiology - Unit 1 Study Guide

*Exam material will come from lectures, labs and required videos.*

### Introduction, Homeostasis and Feedback

What is physiology?

Homeostasis

Positive and negative feedback loops

Responsiveness in feedback loops: are all variables treated the same?

Antagonistic effectors

### Chemical Nature of the Body

Atomic structure, chemical bonds (why atoms form bonds)

Isotopes

Acids, bases, pH scale

Theme: organic molecules have carbon backbones for structural integrity with functional groups attached which give them “flavor”

Four macromolecules of life - know for each

- examples (classes of each if appropriate)
- importance to the body
- structural features (building blocks)

Theme: dehydration synthesis and hydrolysis reactions build up or break down all organic molecules

Importance of polymerization

### Life and Death of Cells

Cytoskeletal components and uses

Cell organelles (basic structure, function of each)

How do cells know when to divide? How do they know what to become?

How do cells die? (apoptosis vs. necrosis)

Hallmarks of cancer

### Nuclear Processes

What are the molecules of inheritance? How do we know?

Nucleotides - structure, polymers

DNA replication

Transcription and translation basics (what is needed, what happens...)

Mutation (Types? Results of mutations? How do they happen?)

Differential gene expression - how do cells control which gene products are actually made?

## Enzymes and Energy

Forms of energy

Laws of thermodynamics

Endergonic vs. exergonic reactions

Terms: enzyme, substrate, product, active site, affinity, cofactors, coenzymes

How do enzymes actually work?

What affects enzyme activity?

Up- and down-regulation of enzymes

Competitive vs. noncompetitive inhibitors - and how do we know which is which?  
(basic Michaelis-Menton kinetics)

## Cellular Metabolism

What is the basal metabolic rate?

How is energy stored in the body (and for how long?)

ATP - hydrolysis, phosphorylation

What are electron carriers and how do they work?

What are redox reactions?

Oxidative phosphorylation vs. substrate-level phosphorylation

Glycolysis, citric acid cycle, ETC: basic overview of each, what are the reactants  
and products, what happens to the energy...

Chemiosmosis theory

When and why do (some) cells run fermentation?

## Membranes and Membrane Transport

Membrane challenges (what do they have to do?)

Structure and components of membranes

How do we classify membrane transport processes?

Passive diffusion, facilitated diffusion

Osmosis

Why do cells polymerize everything for storage?

Active transport (primary vs. secondary)

How can you tell if a transport process is carrier-mediated or not?

Other membrane processes: endocytosis, exocytosis, pinocytosis

Theme: gradients are used to power many active transport mechanisms

## Laboratory Material

Material you covered in lab will also be included on the exam (explain data, predict outcomes based on hypothetical situations similar to those you saw in the laboratory, etc.)

*BRING to Exam 1:*

- *Blue or black pen*
- *#2 pencil(s)*
- *a standard (100 question) scantron sheet*
- *Your lab notebook (to submit for grading)*
- *Notes for Unit 2: Signal Transduction and Endocrinology*