I. **Announcements**: Please check & sign attendance roster. Not on list? See Pat during a break or after class. *Lab 1 Histology* tomorrow in 130 HUE: 12 n & 1 pm sections.

II. **Introduction**: Staff, office hr, required sources, course overview, grading, expectations & success. Q?

III. **Human Physiology** LS ch 1, DC Module 1
   A. What? cf: Anatomy LS p 1
   B. Where? Body Levels of Organization LS pp1-6, DC pp1-5
   C. How? Different Study Approaches LS p 1

IV. **Homeostasis** LS ch 1, DC Module 1
   A. What? Maintenance of ECF LS p 8
   B. Where? ECF = Plasma + Interstitium LS fig 1-4 p 8
   C. How? Simplified Homeostatic Model cf: LS fig 1-7 p 14
      Balances LS p 9, DC pp 5-6
   D. Why? Cell survival! LS fig 1-5 p 9, DC p 5
**BI 121 Required Texts**


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**Human Body Systems**  
Structure, Function, and Environment  
SECOND EDITION  

Daniel D. Chiras

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**Introduction to Human Physiology**  
Department of Biology, BI 121  
Laboratory Manual  
University of Oregon  
Eugene, OR 97403  
Summer 2017

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**DC**  
New (2013 ed) $32.00 Used $23.25

**LM**  
Lab Notebook $9.85
Publisher’s Price → Gold Nuggets?

Fundamentals of Human Physiology 4E
Lauralee Sherwood

LS 2012
New $228.59! Used $30.00-57.00 Rental $19.83 E-Book .pdf $5.00
Dr. Evonuk’s 6 Balances

Metabolic

\[ \text{ANA}^- \quad \text{CATA}^- \]

\[ \text{H}_2\text{O} \]

\[ \text{ToC} \]

\[ \text{O}_2/\text{CO}_2 \]

\[ \text{Ion}^+/\text{-} \]

\[ \text{pH} \]

\[ \text{Carbon Dioxide} \]

\[ \text{Electricity} \]

\[ \text{Bicarbonate and pH Balance} \]
Mitochondria: Energy Organelles

- Intermembrane space
- Cristae
- Proteins of electron transport system
- Inner mitochondrial membrane
- Matrix
- Outer mitochondrial membrane
- Cristae

fig 2-8 LS 2012
AEROBIC w/O₂

% AEROBIC (Oxidative Energy System)

ACTIVITY
Marathon
Cross-Country Skilling
10-K Run
3-Mile Run
2-Mile Run
800-Meter Swim
1-Mile Run
Boxing
200-Meter Swim
Circuit Weight Training
Soccer Lacrosse
Tennis
Basketball
Volleyball
200-Meter Dash
Football
Conventional Weight Training

% ANAEROBIC (Immediate & Non-Oxidative Energy Systems)

TIME (Min:Sec)
135:00
29:00
14:00
9:00
3:45
1:30
0:50
0:20
0:10

FAT, CARBOHYDRATE & PROTEIN
(Small Amounts)

CARBOHYDRATE
(Glucose & Glycogen)

ATP, ADP & Creatine Phosphate (CP)

MITOCHONDRIA

CYTOSOL

Glycolysis

Immediate/ATP-PC

ANAEROBIC
What does DNA look like? Double-helix!!
What are DNA’s major functions?
Heredity + Day-to-Day Cell Function
Dietary Analyses Thanks to Michelle Obama!
Dietary Composition & Physical Endurance

eg, Atkins!

~ 1/3 endurance!

High-fat diet

Normal mixed diet

High-carbohydrate diet

Maximum endurance time:

57 min

114 min

167 min
Digestion Steps

1. Ingestion
2. Mechanical Digestion
3. Chemical Digestion
4. Peristalsis
5. Absorption
6. Storage
7. Defecation

Cardiovascular System

Figure-8 Loop

Pulmonary System

Systemic System

Capillary beds of lungs where gas exchange occurs

Pulmonary arteries

Vena cavae

Aorta and branches

Right ventricle

Left ventricle

Systemic circuit

Arterioles

Capillary beds of all body tissues where gas exchange occurs

Oxygen-poor, CO₂-rich blood

Oxygen-rich, CO₂-poor blood

DC 2003
CABG ≡
Coronary
Artery
Bypass
Graft
Cigarette Smoking: #1 Preventable Cause of Premature Death in the US

![Diagram showing cardiovascular mortality rates related to smoking habits.](image)
How much aerobic?

Continuous exercise
> 50% muscle mass
> Conversational pace
20-60 min/session
3-5 days/wk
Healthy Oils to Minimize Atherosclerosis

HAPOC?
(a) Pressure-recording device
Inflatable cuff
Stethoscope

(b)

(c) When blood pressure is 120/80:

Cuff pressure is greater than 120 mm Hg.
No blood flows through vessel.
No sound is heard.

Cuff pressure is between 120 and 80 mm Hg.
Blood flow through vessel is turbulent whenever blood pressure exceeds cuff pressure.
Intermittent sounds are heard as blood pressure fluctuates throughout cardiac cycle.

Cuff pressure is less than 80 mm Hg.
Blood flows through vessel in smooth, laminar fashion.
No sound is heard.
What's in Blood? Plasma & Blood Cells

Plasma (55% of whole blood)

Buffy coat: platelets and leukocytes (<1% of whole blood)

Erythrocytes (45% of whole blood)

Platelets
Leukocytes (white blood cells)
Erythrocytes (red blood cells)
A & B Antigens
(Agglutinogens)
Glucose: Sugar in Blood

Normal: 70-99
Pre-Diabetes: 100-125
Diabetes: ≥ 126 mg/dL
NB: Diabetics have problems either here or here.

Cellular uptake and utilization of glucose

Fox 1987
ANP = Atrial Natriuretic Polypeptide
Homeostasis is a **dynamic balance** between the autonomic branches.

- **Rest-and-digest:** Parasympathetic activity dominates.
- **Fight-or-flight:** Sympathetic activity dominates.
Homeostasis

Muscular System

Body systems maintain homeostasis

Homeostasis is essential for survival of cells

Cells make up body systems

Cells

© Brooks/Cole - Thomson Learning

LS ch 8 p 202
Atrophy

decrease in size & strength

Hypertrophy

increase in size & strength
Respiratory System Anatomy

**NB:** *In vivo,* Cupola or peak of each lung goes into neck > clavicle line!

- Nasal passages
- Mouth
- Pharynx
- Larynx
- Trachea
- Cartilaginous ring
- Right bronchus
- Bronchiole
- Left bronchus
- Terminal bronchiole
- Alveolar sac
- Pulmonary capillaries
- Alveolar sac
- Branch of pulmonary artery
- Smoother muscle
- Branch of pulmonary vein
- Terminal bronchiole

(b) Enlargement of alveoli (air sacs) at terminal ends of airways.
Not only the Brain, but the Heart & 100s of Other Tissues and Organs are Adversely Affected!
...I ♥ U of O!

Students who succeed are usually those who:

1. **Attend** class regularly
2. **Ask** questions
3. **Come** to office hours & problem-solving sessions
4. **Study** outside class both alone & in study groups
5. **Seek** to understand methods & overarching principles/concepts rather than specific answers
6. **Teach** or tutor others &
7. **Discuss** concepts informally with fellow students.

ANATOMY vs PHYSIOLOGY
STRUCTURE vs FUNCTION
WHAT? vs HOW?
WHERE? vs WHY?
Structure begets function!
Structure gives rise to function!
Structure & function are inseparable!
Knee Structure-Function?
**Preoperative Diagnoses:**
R Knee
Degenerative Joint Disease (DJD) = arthritis
Varus malalignment = bow-leg

**Procedures:**
Arthroscopy & microfracture
High Tibial Osteotomy (HTO)
Packing bone graft substitute

**Blocks/Medications:**
Femoral n. block
General anesthesia
IV Morphine, Oral Oxycontin + Oxycodone,
Tylenol, Injectable Lovenox (enoxaparin Na)
R knee medial meniscus cleavage & tear
R knee lateral compartment in good shape!
1. Arthroscopy clean-up
2. Debridement complete
3. Microfracture with awl
4. Punctuate bleeding
Further bleeding to create superclot!
High-Tibial Osteotomy (HTO) to Realign the Joint

1. Oscillating saw cut
2. R plate/scaffolding insert
3. Align, stabilize w/screws & pack defect
Post- Operative Reality: 10 d injectable anti-coagulant, 3 wk oral anti-coagulant, 4 wk CPM machine, non-wt bearing 8 wk, 12 wk PT, 3-5 d/wk,...
Break for discussion/questions!
Body Levels of Organization

1. Molecular
2. Cellular
3. Tissue
4. Organ
5. System

Entire Organism, like you & me!
Nerve conducts

Muscle contracts

Connective connects!!

Epithelial covers
Epithelial tissue gives rise to glands: (a) exocrine & (b) endocrine
Epithelial tissue in frog skin developing into an exocrine gland!
Organs are made up ≥ 2 tissue types

Organ: Body structure that integrates different tissues and carries out a specific function

- Epithelial tissue: protection, secretion, absorption
- Connective tissue: structural support
- Muscle tissue: movement
- Nervous tissue: communication, coordination, control
Which body systems?
Which body systems?
Why study human physiology?
KNOWLEDGE IS POWER!!!

Thomas Hobbes of Malmesbury
English Philosopher, 1658
Homeostasis is essential for cell survival!

Body systems

Maintain

Homeostasis

Make up

Is essential for survival of

Cells

LS fig 1-6 p 7
Maintenance of a relative constancy in the Internal environment = ECF = fluid outside of cells

milieu interieur?

100 trillion cells working intimately

Claude Bernard

Walter B. Cannon
Where is extracellular fluid?
Where is extracellular fluid?

As long as between/outside cells, ECF everywhere?

G&H 2011
ICF = Intracellular

ECF = Extracellular

Plasma (within CV System)

Interstitium (eg, between muscle cells)
HOMEOKINESIS?
Dr. Evonuk’s 6 Balances

Metabolic

\( \text{O}_2/\text{CO}_2 \)

H₂O

\( \text{pH} \)

\( T^\circ C \)

Ion\(^{+/-}\)

\( \text{ANA}^- \)  \( \text{CATA}^- \)