BIOL241
Intro. Human Anatomy & Physiology I

Announcements
Introductions
Overview & Syllabus
Let's get started!

Introductions
• Note cards
  – Name
  – Year you graduated HS and where
  – Career goal(s)
  – List of classes you have taken that may help prepare you for A&P, WHEN and where you took them (e.g. BIO 101, Fall’11, HCC)
  – List any other relevant experience you have had (job, internship, taking care of relatives, etc.).
  – Your preferred email address

Faculty-Student "Let's Do Coffee"
• pilot program
• $7 voucher to the Espresso Lounge.
• student leadership office, CC 1446 for the application
• Janet Hoppe-Leonard
• Please tell your students about it at the start of classes

BIOL241
• Elementary human anatomy and physiology (1st quarter of 2 quarters)
• described and illustrated in lecture and lab. Designed to establish a basis for studying clinically related subjects in the paramedical fields.
• Clarke O’Reilly, Associate Instructor
• Office hours by appointment: I teach from 08:30 to 13:00, so early afternoon!
About me

- Assoc. Instructor: Clarke O'Reilly
- BA – Biology – Whitman College
- MA – Teaching – Seattle Pacific University
- Graduate student – MS in Biology (for Teachers) at the University of Washington – research area: microbiological ornithology
- Teaching Certificate with endorsements in Biology, General Science (ROE) & Math

Course Requirements

- See the syllabus:
- Attendance, participation (do not miss class or labs!!!)
- BIOL 160 or CHEM 121 (or equivalent) min. grade 2.0 and ENGL 101 eligibility
- Respect for others (and yourself!) Ask questions. Have fun!

Required Texts:

Summer Schedule

- Complete ten(+) weeks of study in only eight weeks!
- Much memorization (see schedule & syllabus)
- Need to identify structures on microscope slides, models, diagrams & specimens.
- No time to fall behind
- 4 exams: 1 every two weeks
**Highlights**

- Class meets in AS1615 M, W and in AS1521 T, Th
- Section: .01 (2055) 08:30 – 10:40
- Section: .04 (2060) 10:50 – 13:00
- Quarter ends Friday 17 Aug., so this class’s Final will be Thurs. 16 Aug.
- Contact: e-mail: [Clarke.OReilly@seattlecolleges.edu](mailto:Clarke.OReilly@seattlecolleges.edu) AND [CFOReilly@mac.com](mailto:CFOReilly@mac.com)

<table>
<thead>
<tr>
<th>Topics</th>
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<tbody>
<tr>
<td>• Cell Biology &amp; Chemistry Chap. 1 – 3</td>
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<td>• Central dogma – Chap. 3</td>
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<tr>
<td>• Epithelial tissue – Chap. 4</td>
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<td>• Connective tissue – Chap. 4</td>
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<td>• Integumentary system – Chap. 5</td>
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<td>• Bone structure &amp; physiology – Chap. 6</td>
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<td>• growth &amp; repair – Chap. 6, 7*</td>
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<td>• Articulations – Chap. 8</td>
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<td>• Muscle structure – Chap. 9</td>
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<td>• Muscle metabolism – Chap. 9, 10*</td>
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<td>• Neurophysiology I &amp; II – chap. 11</td>
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<td>• CNS: Brain and Spinal Cord – Chap. 12</td>
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<td>• Peripheral Nervous System – Chap. 13</td>
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<td>• Autonomic Nervous System – Chap. 14</td>
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<td>• Special Senses – Chap. 15</td>
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**Study aids**

The Loft Writing Center Plus: get help with writing, computers, grammar, spelling, etc. Located: Top Floor of the Library Building, link: [https://northseattle.edu/tutoring/loft-writing-center](https://northseattle.edu/tutoring/loft-writing-center)

**Math Learning Center**: ED 1845, 1845A, link: [https://northseattle.edu/tutoring/math-learning-center](https://northseattle.edu/tutoring/math-learning-center)

- MLC: [http://webshare.northseattle.edu/MLC/](http://webshare.northseattle.edu/MLC/)

**Biology Tutoring**: room AS1615 M-F and in room AS 1614 Saturday. Use MLC link, above and click on Biology Tutoring on left side for current schedule and information.

**Highly Recommended**: get a “study buddy” and, or, form study groups. Quizzing each other and explaining to someone else is very helpful to learning and memorization!

**Mnemonics**

**Study Aids, cont.**

- Self-help information including study skills is available at [http://www.northseattle.edu/services/counseling/selfhelp.htm](http://www.northseattle.edu/services/counseling/selfhelp.htm)
- Weds. 10am-5pm, the Community Psychiatric Clinic has a professional on campus at the Opportunity Center for Employment and Education (OCEE) (206) 943-0393
- OCEE also provides assistance with financial literacy, preparing for the COMPASS test, employment, and many other services [https://news.northseattle.edu/news_feed/OCEE-Display?search_standing=1](https://news.northseattle.edu/news_feed/OCEE-Display?search_standing=1)
More services

- The Seattle/King County, Community Crisis Clinic offers 24-hour listening, consultation, and intervention: 206-461-3222
  Website: http://www.crisisclinic.org
  This website also provides links to dozens of community referral resources
- North's Campus Security 527-3636 provides assistance with health and safety situations.
- Local, public, medical services, are available through NeighborCare Health clinics, and can provide diagnosis and treatment for depression, anxiety, etc. http://www.neighborcare.org

Mnemonic Example

- On Old Olympus' Towering Top A Finn And German Viewed Some Hops:
  - I - Olfactory nerve
  - II - Optic nerve
  - III - Oculomotor nerve
  - IV - Trochlear nerve/pathic nerve
  - V - Trigeminal nerve/dentist nerve
  - VI - Abducens nerve
  - VII - Facial nerve
  - VIII - Vestibulocochlear nerve/Auditory nerve
  - IX - Glossopharyngeal nerve
  - X - Vagus nerve
  - XI - Accessory nerve/Spinal accessory nerve
  - XII - Hypoglossal nerve

Find what works for you!

- Make up your own
- Look online
- Ask the tutors what worked for them
- Did any of their fellow students use something different?
- Quiz each other (study groups, “study buddies”)
- Sketches & drawings to help you remember

http://facweb.northseattle.edu/coreilly/biol241/

The website has:
- Syllabus
- Schedule (& updates)
- Lecture notes
- Objectives (learning goals/study aids) for each unit
- Resources to help you study
Optional Texts:


Grading

Breakdown:

- Exams 400 points
- Lab Practical Quizzes 200 points
- Lab Reports& Assigns 200 points

Total 800 points

(There could be slight modifications on the 3rd item during the quarter.)

Grades

Your grade = points you earn

800 points
Grade Percentages

<table>
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<th>Percentage</th>
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<td>75%</td>
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<td>66%</td>
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Commitment

- This is a very difficult class that requires learning what is essentially a new language
- Because it is a prerequisite, the class is designed by the college as an overview: lots of breadth, little depth
- Expect 20+ hours of reading and studying each week in addition to class sessions
- The pace is a little frantic so missing class is not recommended. Especially labs!

Exams - Thursdays

Four exams:
- 5 July     Exam 1 (Chaps 1 – 4)
- 19 July    Exam 2 (Chaps 4 – 8)
- 2 Aug.     Exam 3 (Chaps 9 – 11)
- 16 Aug.    Exam 4 (Chaps 12 – 15) Final
(Note: You will read and learn chapters 7 and 10 on your own – there will be no or minimal lecture time on them.)

In Class Exams

- A little more than half objective questions: multiple-choice, matching, a few true/false
- The rest: fill-in-the-blank, short answer, short essay, and diagram labeling
- You will need a Scantron form and a #2 pencil for each exam.
- Not cumulative per se
### In Class Exams

- **Exams may not be rescheduled or made-up due to tardiness or absence.** Students with extraordinary circumstances should discuss them with the instructor as soon as the situation occurs.
- **If you know ahead of time that you will miss an exam for a valid reason, I may be able to accommodate you but let me know as far ahead of time as possible. Today would be good.**

### Labs

- Many laboratory exercises must be completed in the laboratory. Students who miss a laboratory exercise should come in during open lab time to make up that exercise.
- Review Sheet at the end of each assigned lab exercises will be due the following week.
- Lab activities are designed to help prepare you for the practical quizzes, but lab material is also fair game on exams.

### Lab Practicals

- Four, each worth 50 points
- Covers the material on the “Lab Practical Study Guide” in the syllabus
- They will involve identifying slides, projected pictures of slides, bones, muscle models, brain models, or diagrams.
- **Because of the time required to set these up, they cannot be made up. If you miss it, you are out of luck. NO EXCEPTIONS.**

### Lab Practical Quizzes

<table>
<thead>
<tr>
<th>Date</th>
<th>Quiz</th>
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<tbody>
<tr>
<td>2 July*</td>
<td>Practical 1: Histology</td>
</tr>
<tr>
<td>18 July</td>
<td>Practical 2: Bones</td>
</tr>
<tr>
<td>1 Aug.</td>
<td>Practical 3: Muscles</td>
</tr>
<tr>
<td>15 Aug.</td>
<td>Practical 4: Nervous</td>
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*May be adjusted to give you more time
Lab Reports and Assignments

- Total of 200 points
  - Lab reports = 150
  - Assignments = 50

Lab Reports

- For each lab assigned, complete all the questions on the lab manual “Review Sheet” found at the end of each lab and turn it in to me the week following each lab. **NOTE:** you must turn in the actual pages torn out of a laboratory manual; no photocopies will be accepted. You must also include any data obtained from the lab exercise or drawings of microscope slides.

Assignments

- In class group work or individual take-home
- Case studies or in-depth look at a topic
- 2-4 assigned depending on timing

Lectures

- Lecture slides available on course website before lecture (some are posted now).
- Lecture material (= slides plus what I say in class) will be what I ask about on exams.
- “Objectives” for each unit will be posted on the website at the beginning of each unit. These are a general idea of what you should know for the exams.
**Summer Class**

- The summer quarter is two weeks shorter than the other quarters
- This causes some scheduling issues that mean that the timing of the exams and practicals is not always optimal
- Also as a result, we will have to skip through some portions of the lecture slides; unless I say otherwise, **you will still be responsible for the material on the exam.**
- Use the objectives as your guide for studying the notes

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**Attendance**

- Students should try to attend every class session. If you miss a class session, it is your responsibility to obtain the lecture notes, to make up laboratory experiments and to obtain handouts, assignments or other materials distributed in class.
- Check with your classmates and on the class website!

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**Introduction to the Human Body**

- "tome" means to cut in Greek
- Describes the **structures** of the body:
  - of what they are made?
  - where they are located?
  - associated structures

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**Anatomy**

- Whole body MRI
  © 2012 General Electric Company
Physiology

- Is the study of:
  - functions of anatomical structures, both individual and cooperative

KEY CONCEPT

- All physiological functions are performed by specific anatomical structures
- Principle of complementarity says that structure and function are complementary
  - Function always reflects structure
  - What a structure can do depends on its specific form
  - "Form follows function"

Introduction

- Key to learning anatomy is understanding function
  - For example:
    - Left side of heart is larger than right.
    - Why is that?

  Structure (anatomy) and function (physiology) are intimately related:
  **INTERCONNECTEDNESS**

Methods of Studying Anatomy

- Gross Anatomy
  - Structures large enough that one can see with the unaided eye
    - Systemic Anatomy - Study of the 11* specific organ systems

- Microscopic anatomy
  - Involves studying anatomical structures that cannot be seen with the unaided eye
    - Cytology – cells
    - Histology – tissue
11 Organ systems

- Integumentary*
- Nervous*
- Skeletal*
- Endocrine
- Muscular*
- Cardiovascular

Lymphatic
Urinary
Respiratory
Reproductive
Digestive

Physiology = Function

- Considers the operation of specific organ systems
  - Renal – kidney function
  - Neurophysiology – workings of the nervous system
  - Cardiovascular – operation of the heart and blood vessels
- Focuses on the functions of the body, often at the cellular or molecular level

Anatomical Organization

- We will start from the smallest and finish with the largest

Levels of Organization

- **Chemical Level**: atoms (e.g. carbon) combine to form molecules (e.g. glucose)
- **Cellular level**:
  - Smallest living units in organisms
  - Cells contain organelles, each with a function
- **Tissue level** - different groups of cells that perform a function
- **Organ Level** - Different types of tissues that perform a common function
- **Organ system** – consists of different organs that work closely together

**INTERCONNECTEDNESS**
Levels of Structural Organization

Biochemicals

- Carbohydrates (Sugars, starches)
- Protein
- Fats (oils, fat, waxes) Lipids
- Nucleic Acids
  - (DNA, RNA)
  - H, C, O \((C_6H_{12}O_6)\)
  - N
  - S

Carbohydrates

- Sugars, starches
- Why are these important?
- Energy providing/storage molecules
- Sugars: smaller molecules
- Saccharides, mono, di, poly
- Starches
- Large molecules
- Cellulose

Proteins

- Structural molecules
- (Muscles)
- Enzymes
- Accelerate chemical reactions
- Amino Acids (AA)
- Polypeptides
- 1°, 2°, 3°, 4°
- Physical Structure governs function
Lipids
- Fats
- Oils
- Waxes
- Lipopolysaccharides
- Bilayer
- Plasma (cell) membranes
- Energy Storage
- 10x sugars or proteins

INTERCONNECTEDNESS

Nucleic Acids
- A, T, G, C, (U)
- Structural components of DNA, RNA
- Genetic code storage
- Translation of the Genetic Code
- Protein (trait) synthesis
- Ribosome structure
- Foundational

Other Levels
- Organismal Level - All systems working together (e.g. humans)
- Ecological level - How organisms interact with each other and their environment

INTERCONNECTEDNESS

KEY CONCEPT
- The body is divided into 11 organ systems
- All organ systems work together
  - Integration

INTERCONNECTEDNESS
Homeostasis

- **Homeostasis**: ability to maintain a relatively stable internal environment in an ever-changing outside world
- All body systems working together to maintain a stable internal environment, respond to external and internal changes to function within a normal range (body temperature, fluid balance)
- The internal environment of the body is in a dynamic state of equilibrium
- Failure to function within a normal range results in disease

Regulation

- Intrinsic regulation
  - When a process regulates itself with no help.
- Most regulatory systems in the body use **extrinsic regulation**:
  - responses controlled by nervous and endocrine systems, e.g. brain regulates body temp
- Usually occurs by **negative feedback**

Feedback

- When the end result or product of a process “feeds back” upon the stimulus to change it
  - **Negative feedback**: end product negates or opposes the stimulus
  - **Positive feedback**: end product enhances or facilitates the stimulus
Negative Feedback

- Most common way that homeostasis is maintained in the body
- In negative feedback systems, the response of the effector negates or opposes the stimulus (shuts off the original stimulus)
- Example: Regulation of room temperature by a thermostat

Positive Feedback

- NOT a way to maintain homeostasis
- Rare in nature because it is a "runaway train"
- The response of the effector output reinforces or exaggerates the stimulus (e.g. blood clotting, ovulation, action potential)
- Requires a failsafe mechanism to stop the vicious cycle
**Homeostatic Imbalance**

- Disturbance of homeostasis or the body’s normal equilibrium
- Overwhelming the usual negative feedback mechanisms allows destructive positive feedback mechanisms to take over
- This is often used as the definition of “disease”

**Anatomical terms**

<table>
<thead>
<tr>
<th>Greek</th>
<th>Latin</th>
<th>Arabic</th>
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**Anatomical Position**

- Hands at sides, palms forward

**Orientation of terms**

- Note that Left/Right are reversed in anatomical figures
- WHY?
**Directional Terms**

- **Superior** and **Inferior** — toward and away from the head, respectively
- **Anterior** and **Posterior** — toward the front and back of the body
- **Medial** and **Lateral** — toward the midline, away from the midline
- **Proximal** and **Distal** — closer to and farther from the origin of the body part (or from the torso)
- **Superficial** and **Deep** — toward and away from the body surface
- **Cranial** and **Caudal** — toward the head and toward the tail

**Alternate Terms**

- Ventral (= Anterior) Vent
- Dorsal (= Posterior) Back
- (note different for humans and other vertebrates!)

**Body Planes**

- Sometimes to gain a greater understanding of 3D images anatomists cut the image at different planes
- Three planes exists in 3D space
  - Two are parallel to the long axis of the body
  - One is perpendicular to the long axis.
**Body Planes**

- **Sagittal** – parallel to long axis, divides the body into right and left parts
  - mid sagittal or medial – sagittal plane that lies on the midline
- **Frontal or coronal** – also parallel to long axis, divides the body into anterior and posterior parts
- **Transverse or horizontal** (cross section, X.S.) – perpendicular to long axis, divides the body into superior and inferior parts

**Anatomical Variability**

- Humans vary slightly in both external and internal anatomy
- Over 90% of all anatomical structures match textbook descriptions, but:
  - Nerves or blood vessels may be somewhat out of place
  - Small muscles may be missing
  - Extreme anatomical variations are seldom seen

**Body Cavities**

- Cranial cavity (contains brain)
- Dorsal body cavity
- Thoracic cavity (contains heart and lungs)
- Abdominal cavity (contains digestive viscera)
- Pelvic cavity (contains bladder, reproductive organs, and rectum)
Body Cavities

- **Dorsal cavity** protects the nervous system, and is divided into two subdivisions
  - Cranial cavity – within the skull; encases the brain
  - Vertebral cavity – runs within the vertebral column; encases the spinal cord
- **Ventral cavity** houses the viscera (internal organs), and is divided into two subdivisions
  - Thoracic
  - Abdominopelvic

Ventral Body Cavity Membranes

- Called **serous membranes** or serosa
  - Parietal serosa lines internal body walls
  - Visceral serosa covers the internal organs
  - Serous fluid separates the serosae

Heart Serosae

*Figure 1.10b*

- Heart
- Parietal pericardium
- Pericardial space with serous fluid
- Visceral pericardium

Serous Membrane Relationship

*Figure 1.10a*

- Outer balloon wall (comparable to parietal serosa)
- Air (comparable to serous cavity)
- Inner balloon wall (comparable to visceral serosa)
SUMMARY

- Structure and function in anatomy and physiology
- Levels of physical organization
- Homeostasis and feedback
- Systems integration and equilibrium
- Anatomical terms
- Locations and functions of major cavities
- Serous membranes in the ventral body cavity

INTERCONNECTEDNESS