

Human Anatomy & Physiology I
BIOL 221 – Fall Semester 2018
9:25-10:40am, Tuesday and Thursday, RITA 101

Instructor: Dr. Jason Vance
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Office Hours: Tu W Th, 11am-12pm, or by appointment

Required text: *Human Anatomy and Physiology, 10th+ Ed. (Marieb and Hoehn)*
Recommended Resources: *Complete Anatomy (app), Mastering A&P (Pearson)*

Course Description

BIOL 221, Human Anatomy & Physiology I, explores the gross morphology, microscopic anatomy, structure and function of the integumentary, skeletal, nervous, muscular (skeletal, cardiac, and smooth) and endocrine systems of the human body. In addition, the lab presents the histology and gross anatomy of these tissues, organs and organ systems, and provides hands-on experience for learning the topics and principles of physiology presented in the lecture. This course is intended for pre-allied health, pre-nursing, and physical education majors.

Learning Outcomes

1. Identify and use the basic vocabulary of human anatomy and physiology.
2. Reiterate key physiological processes, and the relationship between structure and function.
3. Relate physiology to human health and disease.
4. Demonstrate an understanding of the scientific method and experimental design.
5. Demonstrate continued development of written, oral, and computational skill sets.
6. Demonstrate the ability to work as part of team.

Lecture Schedule

Week of	Topic	Book Chapters	Notes, Exams
8/20	Intro, Homeostasis	1	
8/27	Cell, Tissues	2, 3, 4	
9/3	Tissues	4	
9/10	Integumentary System	5	Exam 1 - 9/13
9/17	Bone – Structure	6	
9/24	Bone - Development/Growth	6	
10/1	Skeletal System, Joints	8	
10/8	Excitable Cell Physiology	3, 11	Exam 2 - 10/9
10/15	Excitable Cell Phys, Neuron, Aps, GPs	11	
10/22	Muscle - Skeletal	9	
10/29	Muscle – Skeletal	9, 10	
11/5	Muscle – Cardiac and Smooth	9, 18	Exam 3 – 11/8
11/12	Metabolism	9, 24	
11/19	Endocrine System	16	Thanksgiving Holiday: 11/21
11/26	Endocrine System	16	
	Final Exam (Cumulative)		Tue. Dec 11, 8:00am

LAB SCHEDULE

Week of	Topic	Book Chapters
8/20	No Lab	
8/27	Intro, Microscopy, Cell, Histology	3, 4
9/3	Histology	4
9/10	Histology, Integument	4, 5
9/17	LAB PRACTICAL 1	
9/24	Bone, Skeleton	6, 8
10/1	Skeleton	8
10/8	Skeleton	8
10/15	LAB PRACTICAL 2	
10/22	Muscle - head, torso	9, 10
10/29	Muscle - arms, legs	10
11/5	Fall Break, no Mon/Tue Labs; Muscle - EMG	10
11/12	Muscle - EMG (Mon/Tue); Endocrine (Wed/Thur)	10, 16
11/19	Thanksgiving Break, no Wed/Thur Labs; Endocrine	16
11/26	LAB PRACTICAL 3	

Assessment

Assessment of the course will be in the form of 4 lecture exams, 3 lab practical exams, and 7 lab quizzes. The Laboratory component will make up 40% of your overall BIOL 221 grade. The lecture and laboratory components both count towards the final grade, and are not assessed as separate units.

Lecture

Exam 1	100 pts
Exam 2	100 pts
Exam 3	100 pts
Final Exam	300 pts

Lab

Practical Exam 1	100 pts
Practical Exam 2	100 pts
Practical Exam 3	100 pts
Quizzes	100 pts

Total 1000 pts

Exams will cover material presented in lecture and lab. Lecture exams (1, 2 and 3) and lab practical exams are non-cumulative and will test the material presented since the previous exam. The lecture final exam is a cumulative exam. Lab quizzes will cover material presented during the previous lab session.

Your grades are not curved! For students interested in health-related professions, please consider why this is important.

Grade Policy

93-100% A; 90-92% A-; 87-89% B+; 83-86% B; 80-82% B-; 77-79% C+; 73-76% C; 70-72% C-; 67-69% D+; 63-66% D; 60-62% D-; 0-59% F

Lecture Attendance

Your success in this course will depend on your attendance and study habits. Lectures will not necessarily cover introductory material or general information. Therefore, it is expected that you have read the assigned book chapter prior to attending lecture. The assigned book chapters should serve as an introduction to the topics to be discussed

in lecture, and as a reference when studying the anatomical and physiological principles emphasized in lecture. Lecture PowerPoints will be posted to OAKS, but these do not contain notes, only figures used during lecture.

Lab Attendance

Attendance at your registered lab meeting time is mandatory. You will sign into lab at the start of each session, and you will see your instructor to sign out of lab when you leave. Lecture and lab quizzes will be administered at the beginning of lab. Practical exams are timed and rotate through exam stations in order. If you are late to lab, or miss lab altogether, you will miss the opportunity to answer those questions at the missed quiz/exam stations. If you miss a lab due to an excused absence, then the quiz will be dropped and its score will result from the average of the other quizzes. If you miss 3 or more labs, for any reason, then you will receive a WA (withdrawn for excessive absences) for the course (BIOL 221+221L). This affects your GPA similar to receiving an 'F'.

Student Conduct

1. There is to be no talking during the lecture. If you have a question, please raise your hand prior to asking the question. While answering a student's question, please remain quiet so that the student and other class members can hear the reply.
2. Remember, you are attending the lecture to learn, not to text-message, surf the internet, sleep, or distract the instructor or the other students.
3. Please turn off all cellular phones, tablets/laptops before entering the lecture. Bring a pen/pencil and paper; take notes, draw diagrams and become proficient illustrating the anatomy that underlies the physiological concepts!
4. Be prepared! Read the relevant sections in the assigned book chapters before coming to class and lab.
5. No form of academic dishonesty is acceptable. Dishonesty includes, but is not limited to: cheating on an exam; stealing exam questions; substituting one person for another at an exam; falsifying data; destroying, tampering with, or stealing a computer program or file; and plagiarizing (using as one's own the ideas and writings of another). Lying, cheating, attempted cheating, and plagiarism are violations of our Honor Code that, when identified, are investigated. Each incident will be examined to determine the degree of deception involved. Incidents where the instructor determines the student's actions are related more to a misunderstanding will be handled by the instructor. A written intervention designed to help prevent the student from repeating the error will be given to the student. The intervention, submitted by form and signed by both the instructor and the student, will be forwarded to the Dean of Students and placed in the student's file. Cases of suspected academic dishonesty will be reported directly by the instructor and/or others having knowledge of the incident to the Dean of Students. A student found responsible by the Honor Board for academic dishonesty will receive a XF in the course, indicating failure of the course due to academic dishonesty. This grade will appear on the student's transcript for two years after which the student may petition for the X to be expunged. The student may also be placed on disciplinary probation, suspended (temporary removal) or expelled (permanent removal) from the College by the Honor Board. Students should be aware that unauthorized collaboration -working together without permission- is a form of cheating. Collaboration during the completion of the quizzes or exams is NOT permitted. Other forms of cheating include possessing or using an unauthorized study aid (which could include accessing information stored on a cell phone), copying from others' exams, fabricating data, and giving unauthorized assistance. Students can find the complete Honor Code and all related processes in the *Student Handbook* at <http://www.cofc.edu/generaldocuments/handbook.pdf>
6. If you have a documented disability that may require assistance, you will need to contact the Center for Disability Services for coordination of your academic accommodations. If the CDS will be involved in administering an exam, we request that you inform us in advance (e.g. the day before the exam is not acceptable). The CDS is located in the Lightsey Center in Suite 104. The CDS phone number is (843) 953-1431. For more information about disabilities, see <http://disabilityservices.cofc.edu>.
7. No College of Charleston employee or student should be subject to unwelcome verbal or physical conduct. It is expected that students, faculty and staff will treat one another with respect. Individuals who violate this policy are subject to discipline up to and including termination and/or expulsion from the College and the possibility of civil and criminal prosecution.

Learning Objectives:

Week of 8/20

Intro, Homeostasis

- Form determines function (**Ch. 1.1**)
- Overview of levels of biological organization (**Ch. 1.2**)
 - Organ system overview (*Fig. 1.3*)
- Requirements for life (**Ch. 1.3**)
- Homeostasis (**Ch. 1.4**)
 - Components of homeostatic control (*Fig. 1.4*)
 - Negative (*Fig. 1.5*) and positive (*Fig. 1.6*) feedback mechanisms
- Anatomical position (**Ch. 1.5**; *Fig. 1.7*)
- Anatomical vocabulary (Table 1.2)

Week of 8/27

Cell

- Cell theory (**Ch. 3.1**)
- Fluid mosaic model of the plasma membrane (**Ch. 3.2**)
 - Phospholipids
 - Glycolipids
 - Cholesterol
 - Membrane proteins (**Ch. 3.2**)
 - Cell junctions
 - Tight junctions
 - Desmosomes
 - Gap junctions
- Organelles (**Ch. 3.7**)
 - Mitochondria
 - Ribosomes
 - Endoplasmic reticulum (rough and smooth)
 - Golgi apparatus
 - Peroxisomes
 - Lysosomes
- Nucleus (**Ch. 3.9**)
 - DNA (*Fig. 3.27*)
- RNA (**Ch. 3.11**)
 - Transcription (*Figs. 3.30, 3.31*)
 - Translation (*Figs. 3.32, 3.33*)

Tissues

- Four primary tissue types – epithelium, connective tissue, muscle, nervous.
- Epithelium (**Ch. 4.2**)
 - Simple
 - Squamous
 - Cuboidal
 - Columnar

Week of 9/3

Tissues

- Epithelium (**Ch. 4.2**)
 - Stratified
 - Squamous
 - Cuboidal
 - Columnar
 - Pseudostratified
 - Transitional
- Connective tissue (**Ch. 4.3**; *Fig. 4.8*)
 - Connective Tissue Proper
 - Areolar
 - Adipose

- Dense regular and irregular CT
- Cartilage
 - Elastic
 - Hyaline
 - Fibrocartilage
- Bone
- Blood
- Muscle (**Ch. 4.4; Fig. 4.9**)
 - Skeletal
 - Cardiac
 - Smooth
- Nervous tissue (**Ch. 4.5; Fig. 4.10**)
 - Neurons
 - Neuroglia
 - Astrocytes
 - Microglia
 - Schwann cells and oligodendrocytes
 - Ependymal cells

Week of 9/10

Integumentary System

- Layers of the skin (**Ch. 5.1; Fig. 5.1**)
 - Epidermis (**Ch. 5.2**)
 - Cells
 - Keratinocytes
 - Melanocytes
 - Dendritic cells
 - Tactile cells
 - Layers (*Fig. 5.2*)
 - Stratum basale
 - Stratum spinosum
 - Stratum granulosum
 - Stratum lucidum
 - Stratum corneum.
 - Dermis (**Ch. 5.3; Fig. 5.3**)
 - Papillary layer
 - Reticular layer
- Skin pigmentation (**Ch. 5.4**)
- Structure of hair and the hair follicle (**Ch. 5.5; Fig. 5.6**)
- Structure of nails (**Ch. 5.6; Fig. 5.7**)
- Exocrine glands
 - Eccrine sweat glands
 - Apocrine sweat glands
 - Sebaceous glands
- Functions of the integumentary system (**Ch. 5.8**)
 - Protection/immune
 - Regulation of body temperature
 - Cutaneous sensation
 - Metabolism
 - Blood reservoir
 - Excretion

Week of 9/17

Bone - Structure

- Intro to skeletal system, cartilages (**Ch. 6.1**)
- Functions of bones (**Ch. 6.2**)
- Axial and appendicular skeleton, classification of bone (**Ch. 6.3**)
- Bone Structure (**Ch. 6.4**)
 - Compact (cortical) bone
 - Spongy (trabecular)

Structure of long bone (*Fig. 6.4*)
The osteon (Haversian system) (*Figs. 6.7, 6.6*)
Cells of bone tissue (*Fig. 6.5*)
Chemical composition of bone
Bone markings (Table 6.1)

Week of 9/24

Bone - Development/Growth

Bone development (**Ch. 6.5**; *Figs. 6.8, 6.9*)
Bone growth (*Figs. 6.10, 6.11*)
Bone remodeling (**Ch. 6.6**; *Figs. 6.12, 6.13*)
Repair of fractures (*Fig. 6.14*; Table 6.2).
Bone disorders (**Ch. 6.8**; *Figs. 6.15, 6.16*)

Week of 10/1

Skeleton, Joints

Classifications of joints (**Ch. 8.1**)
Synarthroses
Amphiarthroses
Diarthroses
Fibrous joints (**Ch. 8.2**)
Sutures (*Figs. 8.1a, 7.5b, 7.4*)
Syndesmoses (*Figs. 8.1b; 7.29b&c, 7.34*)
Gomphosis (*Figs. 8.1c, 7.11, 23.12*)
Cartilaginous joints (**Ch. 8.3**)
Synchondroses (*Figs. 8.2a, 7.23a, 6.8, 6.11*)
Symphyses (*Figs. 8.2b, 7.17, 7.31*)
Synovial joints (**Ch. 8.4**)
Structure (*Figs. 8.3, 8.4*)
Movements (*Figs. 8.5, 8.6*)
Types (**Ch. 8.5**; Focus Figure 8.1)
Joint injuries and disorders (**Ch. 8.6**; *Figs. 8.13, 8.14*)

Week of 10/8

Excitable Cell Physiology

Passive and active transport
Diffusion (**Ch. 3.3**; *Figs. 3.6, 3.7*)
Fick's Law of Diffusion
Osmosis (*Figs. 3.8, 3.9*)
Na⁺/K⁺ ATPase (**Ch. 3.4**; Focus Figure 3.1).
Excitable cells
Resting membrane potential (**Ch. 3.5, Ch. 11.4**; *Fig. 3.14*; Focus Figure 11.1)
Nernst Equation
Goldman-Hodgkin-Katz Equation

Week of 10/15

Excitable Cell Phys - Neuron, Graded Potentials and Action Potentials

Graded Potentials (**Ch. 11.5**; *Figs. 11.9 and 11.10*)
Action Potentials (**Ch. 11.6**; Focus Figure 11.2; *Fig. 11.11*)
Synapse (**Ch. 11.7**; Focus Figure 11.3)
Refractory Periods (*Fig. 11.13*)
Encoding (*Fig. 11.12*)

Week of 10/22

Muscle - Skeletal

Review of muscle tissue (**Ch. 9.1**)
Organization of skeletal muscle (**Ch. 9.2**; *Fig. 9.1*; Table 9.1)
Micro-structure and sliding filament theory (**Ch. 9.3**; *Figs. 9.2, 9.3, 9.4, 9.6*)
Muscle stimulation (**Ch. 9.4**; Focus Figure 9.1; *Figs. 9.8, 9.9*)
Excitation-Contraction coupling (*Figs. 9.5, 9.7*; Focus Figure 9.2)

Contraction (Focus Figure 9.3)

Week of 10/29

Muscle – Skeletal

Wave summation and motor unit recruitment (**Ch. 9.5**)

Muscle twitch

Summation (*Figs. 9.11, 9.12*)

Motor units (*Fig. 9.10*)

Recruitment (*Figs. 9.12 and 9.14*)

Factors that affect maximum muscle performance (**Ch. 9.7**; *Figs. 9.18, 9.19, 9.20, 9.21*; Table 9.2).

How muscles are named (**Ch. 10.2**)

Fascicle arrangements (**Ch. 10.3**; *Fig. 10.1*)

Muscle actions (Focus Figure 10.1)

Lever systems (**Ch. 10.4**; *Fig. 10.3*)

Week of 11/5

Muscle – Cardiac and Smooth

Smooth Muscle (**Ch. 9.9**; *Figs. 9.22, 9.23, 9.24, 9.25*)

Cardiac Muscle (**Ch. 18.4, Ch. 18.5**; Table 18.1)

Micro-anatomy (*Fig. 18.11*)

Autorhythmic myocardium (*Fig. 18.12*)

Contractile myocardium (*Fig. 18.5*)

Excitation-contraction coupling

Week of 11/12

Metabolism

Metabolic pathways and muscle performance (**Ch. 9.6**; *Figs. 9.16, 9.17*)

Fatigue

Excess post-exercise oxygen consumption (EPOC)

Metabolism

Anabolism and catabolism (**Ch. 24.3**; *Fig. 24.3*)

ATP synthesis (**Ch. 24.4**; *Figs. 24.4, 24.5*)

glycolysis (*Fig. 24.6*)

Krebs cycle (**Ch. 24.7**)

Electron transport chain (Focus Figure 24.1; *Figs. 24.8, 24.9, 24.10*)

Glycogenesis/glycogenolysis (*Fig. 24.13*)

Lipid metabolism (*Figs. 24.16, 24.15*)

Protein metabolism (*Figs. 24.17, 24.19*)

Week of 11/19

Endocrine System

Endocrine overview (**Ch. 16.1**; *Fig. 16.1*)

Chemical structure of hormones (**Ch. 16.2**)

Mechanisms of action (**Ch. 16.3**)

Secondary messenger system (*Fig. 16.2*)

Direct gene activation (*Fig. 16.3*)

Endocrine stimuli/control (**Ch. 16.4**; *Fig. 16.4*)

Stimuli

Humoral

Neural

Hormonal

Positive vs negative feedback loops

Hormone interactions

Permissiveness

Synergism

Antagonism

Hypothalamus and pituitary gland (**Ch. 16.6**; Focus Figure 16.1; Table 16.2)

Regulation of Growth Hormone (*Fig. 16.5*)

Week of 11/26-12/3

Endocrine System

Thyroid

Regulation of Thyroid Hormone (*Figs. 16.7, 16.8, 16.9; Table 16.3*)

Regulation of Calcitonin

Parathyroid

Regulation of Parathyroid hormone (*Figs. 16.11, 16.12*)

Adrenal gland hormones

Regulation of Water Volume and Blood Pressure

Anti-diuretic hormone (ADH)

Regulation of aldosterone (*Fig. 16.4*)

Humoral control

Renin-angiotensin pathway

ACTH

Atrial natriuretic peptide

Pancreas and regulation of blood glucose (**Ch. 16.11; Figs. 16.17, 16.18, 16.19**)

Insulin

Glucagon

Type 1 vs Type 2 Diabetes.

Parturition (**Ch. 28.16**)