

**THE UNIVERSITY OF NEW MEXICO–  
VALENCIA  
COURSE SYLLABUS  
Biol 2225: Anatomy and Physiology II, Lecture  
Fall 2023**

Instructor: EM DiMenna PhD	<b>Section: 501</b>
Phone: N/A – email me!	Email: edimenna@unm.edu
Class meeting day/time: asynchronous  Office hours are 15 mins before and after each class every week in the classroom 😊  * Changes will be announced in Canvas and in class.	Class location: Canvas.unm.edu

**Course Information**

**Catalog Description**

This course is the second of two that serve as an introduction to human anatomy and physiology for biology majors and allied health students. The course entails describing, explaining, and analyzing structure and function from the submicroscopic to the organismal level with emphasis on specific cellular, tissue, and organ structure and physiology, and organ system structure and function; specifically, the endocrine, cardiovascular, respiratory, urinary, and reproductive systems. Additionally, an analysis of these concepts is included: fluid and electrolyte balance, pregnancy, growth and development from zygote to newborn, and heredity.

Prerequisite: BIOL 2210. 3 credits

**Course Goals**

This is the second course in a two-semester sequence that provides a comprehensive introductory study of the human body for biology majors and allied health students. It is a prerequisite for acceptance to many nursing, dental hygiene, and other allied health programs. It provides a strong foundation in principles and concepts that have many clinical applications. The lab, BIOL 2225L, is strongly recommended as a corequisite because it complements and reinforces the lecture material.

**State Learning Outcomes**

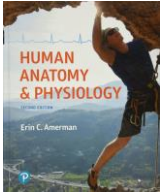
The course objectives are designed to meet the New Mexico State Competency requirements. Upon successful completion of the course, you will be able to:

1. Identify and describe the major anatomical features of the endocrine, cardiovascular, lymphatic, respiratory, digestive, urinary, and reproductive systems.
2. Analyze the physiological roles of the endocrine, cardiovascular, lymphatic, respiratory, digestive, urinary, and reproductive systems in maintaining homeostasis in the human body.
3. Explain how fluid and electrolyte balance is maintained in the human body.
4. Compare and contrast the anatomy and physiology of male and female reproductive systems.
5. Analyze clinical scenarios that demonstrate the relationship between loss of structure and function, or homeostatic imbalance, and disease processes.
6. Solve clinical case studies using the scientific method. Clinical cases will cover current real-world issues in health and medicine.

**Course website**

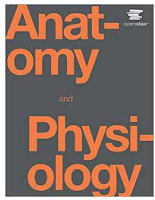
<https://canvas.unm.edu/>.

**Textbooks, Course Materials, Technology:**



Human Anatomy & Physiology 2nd Edition ; ISBN-10. 0134754239 ; ISBN-13. 978-0134754239 ; Edition. 2nd ; Publisher. Pearson ; Publication date. January 8, 2018.

**Optional/Free Textbook:**



OpenStax Anatomy and Physiology. ISBN: 9781938168130, Students can access free online textbook at the OpenStax website or through Amazon.com OpenStax Page.

Although this course uses Pearson materials and the chapters are numbered to the Pearson texts, OpenStax is a free option that covers the majority of the topics we cover nearly identically in terms of content. Also, again, it is FREE.



**Optional/Classic Text: Gray's Anatomy: Anatomical Basis of Clinical Anatomy**

Optional Reading References are according to the Table of Contents for the Gray's Anatomy, 42nd Edition (but editions 39- 41 will also work relatively well)

ISBN 9780702077050 Copyright 2021, Published October 2020, Editor Susan Standring, MBE, PhD, DSc, FKC, Hon FAS, Hon FRCS

Original Authors 1858: Drs Henry Gray and Henry Vandyke Carte

**Optional/Classic Text: Gray's Anatomy: Anatomical Basis of Clinical Anatomy 1918 edition**

Here is the link to the FREE 1918 edition. Whereas there have been many key changes, Much of the Information and many of the illustrations are lovely and largely reliable. It is always important to know your foundations.

<https://www.bartleby.com/107/>

**Technology Recommendations and Requirements**



To ensure the best possible learning experience, owning, or having reliable access to, a modern personal computer with virus protection is recommended.

Online courses perform optimally on high-speed internet, particularly with cable and DSL connections.



Some courses might require the need for a webcam, microphone, and internal and/or external computer speakers in order to participate in group discussions, create and upload video submissions, listen to live or pre-recorded lectures and videos, etc. Please check with your instructor to ask what type of technology might be necessary in order to be successful in the course. Technology requirements may vary from class to class.



**Visit the Canvas [browser and computer requirements page](#) and run their browser checker to make sure you are ready to go!**

**Other types of Technology Requirements to be a successful online student:**

- A working black and white printer for assignments or a digital tablet, software and stylus for editing and saving a modified .pdf

- Ability to scan an upload paper documents as a .pdf (Dropbox and the Apple 'Files' app both have this ability)
- A color camera. Phone cameras and webcams are fine.
- Our class will specifically require the ability to convert and upload a printed or digitally downloaded document into a quality .pdf/photoshop document file. The quality of the document must be equivalent to the quality of the original document for grading purposes.
- You must have the ability to seamlessly run a Zoom based meeting with video and audio for scheduled class meetings.
- YouTube proficiency and ability to skip an ad or two.
- Reliable word processing software such as MS Word. UNM students can download MS Office 365 for free. [Details on what it is and who is eligible.](#)
- Please note that Mac Pages and Google doc files are not accepted for submitted assignments. Both programs have Export or Save as options that let you convert your work to .docx.
- Ability to view course materials by using Adobe Acrobat free file reader and MS Word.
- Regular and weekly access to [UNM Canvas](#) and your [UNM email](#) account.
- Possibly the ability to download and use [Kaltura Capture](#) or Adobe Premier Rush, Adobe's video editing tool. UNM students can download Adobe Premier Rush for free through [Adobe Creative Cloud](#). *Note: branch campus students should double-check to make sure your campus is participating.*

### **Essential Skills**

Because this is a General Education Core course, activities will be incorporated into this course to support development of the following three essential skills that are required by NM/HED: *Critical Thinking, Personal & Social Responsibility, Quantitative Reasoning*

Student progress in developing essential skills will be measured in assignments, discussions, and/or exams throughout the course.

### **Grades and Grading Policies**

Unless Otherwise Noted – ALL ASSIGNMENTS ARE LISTED ON THE SCHEDULE POSTED TO CANVAS SUBJECT TO CHANGE. Usually these are extensions due to server/ hosting issues and work in the students' favor.

Grades are typically comprised of no less than 70% Exams and Quizzes. Please make sure your Software and hardware is up to date and functional since extensions will not be granted if you have not maintained these essential tools.

### **Attendance, Participation:**

- a) **Attendance:** based on assignment completion
- b) **Participation:** based on assignment completion

*Spelling* can affect your grade. If a word sounds about right and has the same number of syllables it will be counted as correct. However, be forewarned there are several words (e.g., perineal & peroneal) that look and sound similar. If you write the wrong word, it is wrong.

You should discuss any planned absences or problems regarding attendance with me. In addition, you should talk with me as soon as possible any time you miss more than one class or if you fail to complete assigned work.

### **Extra Credit:**

If extra credit is offered it will not exceed 5% of the total grade. If extra credit is offered it will be to the entire class.

**PLAGIARISM** --- if you copy an answer (75%+ word for word) from the book, internet, or my PowerPoint slides, you will get a **ZERO** on the ENTIRE assignment.

### **Other Requirements:**

- Students are responsible for all materials covered in class and in the reading assignments. Some book material that is not covered in class may still appear on examinations.
- Students are expected to do their readings before class.
- Students are expected to reach out to their instructor for help via email so that we can meet during office hours. Anatomy and Physiology can be hard- don't give up! Let me help!
- Students may be expected to seek out information on websites, online labs or other books to further their understanding of the material covered in class.
- Students themselves are responsible for seeking information on any assignments that may have been given out during their absence. Please email me or come to office hours!

**Dropping the Class:**

The instructor will likely drop students for inactivity of 1 or more weeks or inappropriate/aggressive behavior toward the instructor or other students. However, students wishing to be dropped from the course should be aware that it is their responsibility to remove drop themselves from the course. Elective drops must be performed by the students and before the expiry of the institutional drop dates.

**Grading**

Total Points refers to the total points capped. Some categories have a higher possible total points but points earned above the Total Points number cap are considered to be dropped items

Extensions can be granted with documentation of an institutionally recognized cause, such as providing a doctor's note after an illness. Documentation is required in order to evidence that the instructor is providing equitable treatment for all students.

If you miss an assignment or quiz, please note that I do drop 25pts prior to the calculation of the overall course grade.

<b>Grading Categories</b>	<b>Points per Assignment (Some exceptions/are indicated on assignment)</b>	<b>Total Points *</b>
<b>Final Exam</b>	100	100
<b>Midterm Exams-4</b>	50	200
<b>Quizzes -9</b>	10	90
<b>Discussions – 2</b>	15	30
Study Guides Uploads -4 (one per Exam)	25	100
<b>Start Up Materials: Syllabus Quiz, Intro Discussion</b>	3, 2 Respective ly	5
<b>Total Points</b>		525
<b>Points dropped</b>		25
<b>point total for final grade</b>		500

For this class grade:	You need this percentage:	Points needed for listed letter grade
A	90 - 100%	450 and above
B	80 – 89%	400-449

For this class grade:	You need this percentage:	Points needed for listed letter grade
C	70 – 79%	350-399
D	60 – 69%	300-349
F	< 60%	299 and under

### **Academic Honesty**

Students should consult the UNM Student Handbook (available on UNM bookstore or from the administration upon request) for a complete explanation on Academic Dishonesty. Students who commit any form of academic dishonesty on an assignment may be assigned a grade as severe as a “0” or “F” for this assignment by the instructor, or will be informed by the instructor that the Dean of Students will be contacted to coordinate a more severe penalty for the offense (e.g. an “F” for the course, or removal from a program - in the case of limited entry programs such as exist in Health Occupations). In the latter case, a centralized record of the student’s academic dishonesty incident will be maintained within the Dean of Students Office so that, if future incidents are reported, patterns of behavior can be identified and sanctioned more severely. Sanctions that may be imposed include disenrollment from the course, suspension from campus, expulsion from the institute, and other administrative actions.

The following are some forms of cheating:

- Copying a fellow student’s work or copying a previous student’s work.
- Notes written on body parts, clothing, cheat sheets, etc... at the time of a test.
- Any form of communication with your neighbor during a test.
- Talking to anyone but the instructor or proctor during a quiz or examination.
- Communicating via cell phones with other people during a test.
- Notes or books open during in-class exams and quizzes.

- Disclosing or soliciting examination questions to those who may have been absent from an exam.
- Plagiarism (copying entirely or whole phrases from books or websites).
- Any two students handing in assignments with word-for-word responses.

You are expected to maintain the highest standards of honesty and integrity in academic and professional matters. The University reserves the right to take disciplinary action, including dismissal, against any student who is found responsible for academic dishonesty. Any student who has been judged to have engaged in academic dishonesty in course work may receive a reduced or failing grade for the work in question and/or for the course. Academic dishonesty includes, but is not limited to, dishonesty on quizzes, tests, or assignments; claiming credit for work not done or done by others (plagiarism); and hindering the academic work of other students. A brief guide to what constitutes plagiarism and how to avoid it can be found here:

<http://losalamos.unm.edu/library/docs/avoiding-plagiarism.pdf> .

You should take care not to leave your computer or thumb drive where others can steal or copy your work or make your files “public.” When using a public computer, you should make sure that you erase your work from the computer and remove your thumb drive.

### **Course Communications**

Basically, I’m on email. Lobomail to be exact. I check it all of the time. If you email me on Friday afternoon and I don’t get back to you until Monday evening – which may happen since that is my usual longest weekly response gap 72 hours over the weekend and 48 hours over the weekdays. We need to keep all communications to Lobomail and Zoom meetings so I will not be responding on messaging apps, gmail, Hotmail, Texts etc.

### **Unexpected Class Cancellations**

If the class has to be canceled due to my illness or an emergency, I will attempt to notify you by email, text, or phone, but that may not be possible. For in person classes: If I'm not present at the beginning of class, you should wait 15 minutes (in case I am simply late), then go to the Office of Instruction (Bldg 6) to see if they have information (available 8-5 M-F). **If there is no information, you should assume that class has been canceled for the day and that you are free to leave.**

Online classes are asynchronous and unlikely to be cancelled. Should that occur, announcements will be posted in canvas and/or UNM email.

### **Campus Closings and LoboAlerts**

Class will be canceled if UNM-LA closes (e.g., in case of bad weather). Here are several ways to check for closing:

- Call the University switchboard at 505-662-5919 or 1-800-894-5919 and listen for a recorded announcement.
- You can receive a text message about campus emergencies via LoboAlerts. Confirm that you are signed up to receive notifications on <http://loboalerts.unm.edu>.

Weather and road conditions vary a lot from place to place in this region, and if you feel that it is unsafe to drive to campus from where you live or work, even if classes have not been canceled, notify me about the reason for your absence, and we'll work it out. Don't jeopardize your safety.

### **American Disabilities Act**

"In accordance with University Policy 2310 and the American Disabilities Act (ADA), reasonable academic accommodations may be made for any qualified student who notifies the instructor of the need for an accommodation. It is imperative that you take the initiative to bring such needs to the instructor's attention, as the instructor is not legally permitted to inquire. The student is responsible for demonstrating the need for an academic adjustment by providing Student Services with complete and appropriate current

documentation that establishes the disability, and the need for and appropriateness of the requested adjustment(s). However, students with disabilities are still required to adhere to all University policies, including policies concerning conduct and performance. Students who may require assistance in emergency evacuations should contact the instructor as to the most appropriate procedures to follow. Contact Accessibility Services at 505-661-4692 for additional information." The UNM Accessibility Resource Center's web site is at this link: <http://as2.unm.edu>

Information about Canvas Accessibility is available here:

<https://www.instructure.com/canvas/accessibility>

## **5. Academic Policies**

Visit

<https://losalamos.unm.edu/academics/academic-policies.html> for important academic policies on:

- Computer requirements
- Campus computer account
- Technical support
- Academic support
- UNM Drop policy
- Sexual misconduct policy

## **Study Time**

For every hour "in-class" a student should set aside another 4 hours of study time outside of class. This course has 4 contact hours. This translates to a minimum of 8 hours a week of study time outside of lab/class for a total of 12 hours. Most likely you will really need **17-21 hours a week.**

## **Online Etiquette**

This course will require moderate online interaction. Students are required to treat other individuals with the same level of respect that they would in the live classroom. Do remember that there is a person at the other side of a discussion posting, online office hours, etc. when posting a response, question, or e-mail. In addition, you are

responsible to make a sincere effort that all online postings, e-mails, etc. use the level of spelling and grammar and courteous tone that is expected in a professional college setting.

## Unit Learning Objectives

Adapted (unless otherwise noted) from the [HAPS, National Anatomy & Physiology Learning Outcomes](#)

## The Cardiovascular System

*Alignment with Course Learning Outcome(s): 1, 2*

1. General functions of the cardiovascular system
  - a. Describe the major functions of the cardiovascular system.
2. Composition of Blood Plasma
  - a. Describe the overall composition of plasma, including the major types of plasma proteins, their functions and where in the body they are produced.
3. Identity, microscopic anatomy, numbers, formation, & functional roles of the formed elements of blood
  - a. With respect to the structure and numbers of formed elements in blood:
    - i. State the normal ranges for erythrocyte counts and hematocrit (both male and female), total leukocyte count, and platelet count.
    - ii. List the five types of leukocytes in order of their relative prevalence in normal blood and classify each type as granulocyte or agranulocyte.
    - iii. Explain how platelets differ structurally from the other formed elements of the blood
  - b. With respect to development of formed elements:
    - i. Describe the location of hematopoiesis and the significance of the pluripotent stem cell (hemocytoblast).
    - ii. Explain the basic process of erythropoiesis, the significance of the reticulocyte, and regulation through erythropoietin.
4. Hemostasis, including coagulation of blood
  - a. Distinguish between the terms hemostasis and coagulation.
  - b. With respect to the phases of hemostasis:
    - i. Describe the vascular phase including the role of endothelial cells.
    - ii. Describe the role of platelets and the steps involved in the formation of the platelet plug.
    - iii. Describe the basic steps involved in the formation of the insoluble fibrin clot.
    - iv. Differentiate between the intrinsic and extrinsic clotting mechanisms.
  - c. Explain how the positive feedback loops in the platelet and coagulation phases promote hemostasis.
  - d. Explain the role of calcium ions and vitamin K in blood clotting.
  - e. Discuss the process of fibrinolysis, including the roles of plasminogen, tissue plasminogen activator and plasmin.
  - f. Explain the mechanisms of action and give examples of procoagulants, anticoagulants and fibrinolytic drugs.
5. ABO & Rh blood grouping
  - a. Explain the role of surface antigens on RBCs in determining blood groups.
    - iii. Discuss the difference in leukopoiesis of granulocytes and agranulocytes.
    - iv. Discuss the role of the megakaryocyte in the formation of platelets.
  - c. With respect to the functional roles of formed elements:
    - i. State the function of red blood cells.
    - ii. Discuss the structure and function of hemoglobin, as well as its breakdown products.
    - iii. Describe functions for each of the five major types of leukocytes as well as the two major subtypes of lymphocytes (T and B).
    - iv. State the function of platelets.

- b. List the type of antigen and the type of antibodies present in each ABO blood type.
  - c. Describe how the presence or absence of Rh antigen results in blood being classified as positive or negative.
  - d. Distinguish between the development of anti-Rh antibodies and the development of anti-A and anti-B antibodies.
  - e. Predict which blood types are compatible and what happens when the incorrect ABO or Rh blood type is transfused.
  - f. State which blood type is considered the universal donor and which blood type is considered the universal recipient, and explain why
6. Gross & microscopic anatomy of the heart
- a. Describe the position of the heart in the thoracic cavity.
  - b. Identify and describe the function of the primary internal structures of the heart, including chambers, septa, valves, papillary muscles, chordae tendineae, and venous and arterial openings.
  - c. Compare and contrast the structure and function of the atrioventricular and the semilunar valves
  - d. Describe the layers of the pericardium and the location of the pericardial cavity.
  - e. Identify the myocardium and describe its histological structure, including the significance of intercalated discs.
  - f. Discuss the structure and significance of the endocardium.
  - g. Identify the right and left coronary arteries and their branches, the cardiac veins, and the coronary sinus.
7. Physiology of cardiac muscle contraction
- a. List the phases of the cardiac muscle action potential and explain the ion movements that occur in each phase.
  - b. Contrast the way action potentials are generated in cardiac pacemaker cells, in cardiac contractile cells and in skeletal muscle cells.
  - c. Explain the significance of the plateau phase in the action potential of a cardiac contractile cell.
  - d. Compare and contrast cardiac muscle contraction and skeletal muscle contraction.
  - e. Compare and contrast the role of nerves in the depolarization of cardiac pacemaker cells, ventricular contractile cells, and skeletal muscle cells.
8. Blood flow through the heart
- a. Identify the major blood vessels entering and leaving the heart and classify them as either an artery or a vein and as containing either oxygen-rich or oxygen-poor blood.
  - b. Describe blood flow through the heart naming all chambers and valves passed.
  - c. Explain the major factors that aid in movement of blood through the heart and produce one-way flow.
  - d. Explain how the heart is a double pump and why this is significant.
9. Conduction system of the heart & the electrocardiogram
- a. With respect to the conduction system of the heart:
    - i. Describe the systemic and pulmonary circuits and discuss the functions of each.
    - ii. State which blood vessel type carries oxygen-rich blood and which type carries oxygen-poor blood in each circuit.
  - b. With respect to the coronary circulation:
    - i. Trace blood flow through the coronary circulation from the aorta to the right atrium.
    - ii. Discuss the significance of collateral coronary circulation.
10. Cardiac cycle
- a. Define cardiac cycle, systole, and diastole.
  - b. Describe the phases of the cardiac cycle including ventricular filling, isovolumetric contraction, ventricular ejection, and isovolumetric relaxation.
  - c. Relate the EKG waveforms to the normal mechanical events of the cardiac cycle.
  - d. Explain how atrial systole is related to ventricular filling.
  - e. Relate the opening and closing of specific heart valves in each phase of the cardiac



- cycle to pressure changes in the heart chambers.
- f. Relate the heart sounds to the events of the cardiac cycle.
  - g. Define systolic and diastolic blood pressure and interpret a graph of aortic pressure versus time during the cardiac cycle.
  - h. Compare and contrast pressure and volume changes of the left and right ventricles during one cardiac cycle.
  - i. Given the heart rate, calculate the length of one cardiac cycle.
11. Regulation of cardiac output, stroke volume, & heart rate
    - a. With respect to cardiac output (CO):
      - i. Define cardiac output, and state its units of measurement.
      - ii. Calculate cardiac output, given stroke volume and heart rate.
      - iii. Predict how changes in heart rate (HR) and/or stroke volume (SV) will affect cardiac output.
      - iv. Predict how changes in heart rate (HR) and/or stroke volume (SV) will affect cardiac output.
      - v. Discuss the concept of cardiac reserve.
    - b. With respect to stroke volume (SV):
      - i. Define end diastolic volume (EDV) and end systolic volume (ESV) and calculate stroke volume (SV) given values for EDV & ESV.
      - ii. Define venous return, preload and afterload, and explain the factors that affect them as well as how each of them affects EDV, ESV and SV.
      - iii. Explain the significance of the Frank-Starling Law of the heart.
      - iv. Discuss the influence of positive and negative inotropic agents on SV.
    - c. With respect to HR:
      - i. Discuss the influence of positive and negative chronotropic agents on HR.
      - ii. Explain the relationship between changes in HR and changes in filling time and EDV.
  12. Anatomy & functional roles of the different types of blood vessels
    - a. Compare and contrast the structure of arteries and veins and arterioles and venules.
    - b. With respect to arteries and veins:
      - i. List the types of arteries and veins.
      - ii. Correlate the anatomical structure of each type of blood vessel with its function.
      - iii. Define vasoconstriction, vasodilation, and venoconstriction.
    - c. Describe the role of arterioles in regulating tissue blood flow and systemic arterial blood pressure.
    - d. With respect to capillaries:
      - i. Explain how the composition of capillary walls differs from that of other blood vessels.
      - ii. List types of capillaries and state where in the body each type is found.
      - iii. Correlate the anatomical structure of capillaries with their functions.
    - e. Describe the location and function of the venous reserve.
    - f. Define anastomosis and explain the significance of anastomoses, such as the Circle of Willis.
  13. Pattern of blood circulation throughout the body, including systemic, pulmonary, coronary, hepatic portal, & fetal circulations
    - a. With respect to the systemic and pulmonary circuits:
      - i. the systemic and pulmonary circuits and discuss the functions of each.
      - ii. State which blood vessel type carries oxygen-rich blood and which type carries oxygen-poor blood in each circuit.
    - b. With respect to the coronary circulation:
      - i. Trace blood flow through the coronary circulation from the aorta to the right atrium.

- ii. Discuss the significance of collateral coronary circulation.
  - c. With respect to the hepatic portal circulation:
    - i. Identify the abdominal veins that coalesce to form the hepatic portal vein, and list additional veins that empty into it.
    - ii. Explain how the anatomical design of the hepatic portal circulation serves its function.
14. Blood pressure & its functional interrelationships with cardiac output, peripheral resistance, & hemodynamics
- a. Define blood flow, blood pressure, and peripheral resistance.
  - b. State and interpret the equation that relates blood flow to pressure and resistance.
  - c. List the local, hormonal and neuronal factors that affect peripheral resistance and explain the importance of each.
  - d. Interpret relevant graphs to explain the relationships between vessel diameter, cross-sectional area, blood pressure, and blood velocity.
  - e. Using a graph of pressures within the systemic circuit, interpret the pressure changes that occur in the arteries, capillaries, and veins.
  - f. Given values for systolic and diastolic blood pressure, calculate pulse pressure (PP) and mean arterial pressure (MAP).
  - g. With respect to capillary exchange:
    - i. Explain the role of diffusion in capillary exchange of gases, nutrients, and wastes.
    - ii. Explain the roles of filtration and reabsorption in capillary exchange of fluid.
    - iii. Describe how net filtration pressure across the capillary wall determines movement of fluid across the capillary wall.
  - iv. Relate net filtration pressure to potential edema and the need for a functional lymphatic system.
  - h. Discuss how muscular compression and the respiratory pump aid venous return.
  - i. With respect to autoregulation:
    - i. Explain how autoregulation controls blood flow to individual tissues.
    - ii. Explain the role of the precapillary sphincter in autoregulation.
    - iii. List some chemicals that cause vasodilation and explain when they are active.
    - iv. List some chemicals that cause vasoconstriction and explain when they are active.
  - j. With respect to regulation of blood pressure:
    - i. During the baroreceptor reflex, explain how cardiac output and peripheral resistance are regulated to maintain adequate blood pressure on a moment-to-moment basis.
    - ii. Explain the relationship of blood volume to blood pressure and describe the mechanisms of how this is altered by the kidney.

## The Lymphatic System

*Alignment with Course Learning Outcome(s): 1, 2*

*Taught with two chapters/sections: Blood and Lymph:*

General functions of the lymphatic system

- a. Describe the major functions of the lymphatic system.
- 2. Lymph & lymphatic vessels
  - a. Compare and contrast whole blood, plasma, interstitial fluid, and lymph.
  - b. Compare and contrast lymphatic vessels and blood vessels in terms of structure and function.
  - c. Describe the path of lymph circulation.
  - d. Describe the mechanisms of lymph formation & circulation.
- 3. Lymphatic cells, tissues, & organs

- a. Describe the basic structure and cellular composition of lymphatic tissue and correlate it to the overall functions of the lymphatic system.
- b. For the lymph nodes, thymus, spleen, tonsils and other aggregations of mucosae-associated lymphatic tissue (MALT):
  - i. Identify and describe the gross anatomical features of each organ or tissue.
  - ii. Identify and describe the microscopic anatomy of each organ or tissue.
  - iii. Describe the location in the body of each organ or tissue.
  - iv. Describe the function of each organ or tissue.
- e. Relate the anatomical structures of the respiratory system to adjacent organs and tissues.
- f. For each of the following - respiratory (nasal) mucosa, the layers of the tracheal wall, the bronchi and bronchioles, the three cell types found in alveoli, and the respiratory membrane:
  - i. Identify each structure.
  - ii. Describe the microscopic anatomy of each structure.
  - iii. State the function of each structure.
- g. Describe the changes in epithelial and connective tissue seen in various portions of the air passageways and relate these changes to function.

## The Respiratory System

*Alignment with Course Learning Outcome(s): 1, 2, 3*

1. General functions of the respiratory system
  - a. Describe the major functions of the respiratory system.
  - b. Describe the four respiratory processes - ventilation, external respiration (gas exchange at lung), internal respiration (gas exchange at body tissues), and cellular respiration.
2. Gross & microscopic anatomy of the respiratory tract & related organs
  - a. Describe and distinguish between the upper and lower respiratory tracts.
  - b. Describe and distinguish between the conducting and respiratory zones of the respiratory tract.
  - c. List, in order, the respiratory structures that air passes through during inspiration.
  - d. For each of the following - nasal cavities, paranasal sinuses, pharynx, larynx, trachea, bronchi, lungs, pleural membranes, pulmonary blood vessels and nerves, thoracic and pleural cavities, and diaphragm:
    - i. Identify each structure.
    - ii. Describe the gross anatomical features of each structure.
    - iii. State the function of each structure.
3. Mechanisms of pulmonary ventilation
  - a. Define pulmonary ventilation, inspiration, and expiration.
  - b. Identify the muscles used during quiet inspiration, during forced inspiration, and during forced expiration, as well as the nerves responsible for stimulating those muscles.
  - c. Define and state relative values for atmospheric pressure, intrapulmonary pressure, intrapleural pressure, and transpulmonary pressure.
  - d. State Boyle's Law and relate this law to the specific sequence of events (muscle contractions/relaxations and pressure/volume changes) causing inspiration and expiration.
  - e. Explain how each of the following affect pulmonary ventilation: bronchiolar smooth muscle contractions, lung and thoracic wall compliance and recoil, and pulmonary surfactant and alveolar surface tension.
  - f. Describe the forces that tend to collapse the lungs and those that normally oppose or prevent collapse.
4. Pulmonary air volumes & capacities
  - a. Define, identify, and determine values for the respiratory volumes (IRV, TV, ERV, and RV) and respiratory capacities (VC and TLC).
  - b. Define minute respiratory volume (MRV) and alveolar ventilation rate (AVR).

- c. Define anatomical dead space and explain the effect of anatomical dead space on alveolar ventilation and on the composition of alveolar and expired air.
5. Mechanisms of gas exchange in the lungs & tissues
- a. State Dalton's Law and Henry's Law, and relate both laws to the events of external and internal respiration and to the amounts of oxygen and carbon dioxide dissolved in plasma.
  - b. With respect to external respiration:
    - i. Describe oxygen and carbon dioxide concentration gradients and net gas movements.
    - ii. Analyze how oxygen and carbon dioxide movements are affected by changes in partial pressure gradients (e.g., at high altitude), surface area, diffusion distance, and solubility and molecular weight of the gases.
    - iii. Describe the mechanisms of ventilation-perfusion coupling and predict the effect that reduced alveolar ventilation has on pulmonary blood flow and the effect that reduced pulmonary blood flow has on bronchiole diameter and alveolar ventilation.
  - c. With respect to internal respiration:
    - i. Describe oxygen and carbon dioxide concentration gradients and net gas movements.
    - ii. Explain the factors that maintain oxygen and carbon dioxide gradients between blood and tissue cells.
6. Mechanisms of gas transport in the blood
- a. With respect to oxygen transport:
    - i. Describe the ways in which oxygen is transported in blood and discuss the relative importance of each to total oxygen transport.
    - ii. State the reversible chemical equation for oxygen binding to hemoglobin and predict how raising or lowering the partial pressure of oxygen will shift the equilibrium.
  - b. With respect to the oxygen-hemoglobin saturation curve:
    - i. Interpret the curve at low and high partial pressures of oxygen.
    - ii. List factors that shift the curve down and to the right, and explain how this results in increased oxygen delivery to the tissues.
    - iii. List factors that shift the curve up and to the left, and explain how this facilitates oxygen binding to hemoglobin in the lungs.
  - c. With respect to carbon dioxide transport:
    - i. Describe the ways in which carbon dioxide is transported in blood and discuss the relative importance of each to total carbon dioxide transport.
    - ii. State the reversible chemical equation for the reaction of carbon dioxide and water to carbonic acid and then to hydrogen ion and bicarbonate ion.
    - iii. Explain the relationship between pH and hydrogen ion concentration.
    - iv. Predict how changing the partial pressure of carbon dioxide will affect the pH and the concentration of bicarbonate ions in the plasma.
    - v. Predict how changing the pH or the concentration of bicarbonate ions will affect the partial pressure of carbon dioxide in the plasma.
    - vi. State the reversible chemical equation for carbon dioxide binding to deoxyhemoglobin and predict how changing carbon dioxide concentrations will affect deoxyhemoglobin levels in the tissues and the lungs.
    - vii. Explain how each of the following relates to carbon dioxide transport: carbonic anhydrase, hydrogen ions binding to hemoglobin and plasma proteins, the chloride ion shift, and the

oxygen-hemoglobin saturation level.

7. Control of pulmonary ventilation
  - a. Describe the locations and functions of the brainstem respiratory centers.
  - b. List and describe the major chemical and neural stimuli to the respiratory centers.
  - c. Compare and contrast the central and peripheral chemoreceptors.
  - d. Define hyperventilation, hypoventilation, panting, eupnea, hyperpnea and apnea.
8. Application of homeostatic mechanisms
  - a. Provide specific examples to demonstrate how the respiratory system responds to maintain homeostasis in the body.
  - b. Explain how the respiratory system relates to other body systems to maintain homeostasis.
9. Predictions related to homeostatic imbalance, including disease states & disorders
  - a. Predict factors or situations affecting the respiratory system that could disrupt homeostasis.
  - b. Predict the types of problems that would occur in the body if the respiratory system could not maintain homeostasis.

the particular organs in which they are located.

- b. With respect to the oral cavity:
  - i. Describe the anatomy of the oral cavity.
- c. Identify the naso-, oro- and laryngopharynx and classify these regions with respect to passage of food and/or air through them.
- d. With respect to the esophagus:
  - i. Describe the structure and discuss the function of the upper esophageal and lower esophageal (cardiac) sphincters.
  - ii. Describe the locations of skeletal and smooth muscle within the wall of the esophagus.
- e. With respect to the stomach:
  - i. Describe the structure and discuss the function of the cardiac and pyloric sphincters.
  - ii. Identify the structure and discuss the function of the cardiac region, the fundus, the body and the pyloric region of the stomach.
  - iii. Discuss the significance of rugae.
  - iv. Discuss the function of the oblique muscle layer of the stomach.
  - v. Identify the structure of a gastric gland including the location of the chief (zymogenic) cells, parietal (oxyntic) cells, enteroendocrine cells, and mucous cells, and discuss the functions of these different cell types.
- f. With respect to the small intestine:
  - i. Identify the location and discuss the relative length and the functions of the duodenum, jejunum, and ileum.
  - ii. Identify and discuss the histology and functions of the plicae circulares, villi, and microvilli.
  - iii. Identify Brunner's glands (duodenal glands) in the duodenum and Crypts of Lieberkuhn (intestinal glands) in all portions of the small intestine, and discuss the function of these glands.
- g. With respect to the large intestine:

## The Digestive System

*Alignment with Course Learning Outcome(s): 1, 2*

1. General functions of the digestive system
  - a. Describe the major functions of the digestive system.
2. Gross & microscopic anatomy of the alimentary canal
  - a. With respect to the wall of the alimentary canal:
    - i. Identify, and describe the histological structure and the function of, each of the four layers of the wall - the mucosa, the submucosa, the muscularis externa, and the serosa (visceral peritoneum).
    - ii. Describe regional specializations in the histological structure of the alimentary canal and relate these specializations to the functions of

- i. Describe the structure and discuss the function of the ileocecal valve and the internal and external anal sphincters.
  - ii. Identify the location and discuss the functions of the cecum and appendix, the ascending, transverse, descending, and sigmoid colon, the rectum, and the anus.
  - iii. Identify and discuss the functions of teniae coli, haustra, and epiploic appendages.
- 3. Peritoneum & mesenteries
  - a. Describe the histology of the visceral and parietal peritoneum.
  - b. Differentiate between intraperitoneal and retroperitoneal location of digestive structures.
  - c. Identify the mesenteries and explain their function.
- 4. Motility in the alimentary canal
  - a. List the structures involved in the process of deglutition and explain how they function, including the changes in position of the glottis and larynx that prevent aspiration.
  - b. Define the terms peristalsis, segmentation, migrating myoelectric complex, and mass movement, and discuss the role that these activities play in the function of various regions of the alimentary canal.
  - c. Explain how volume, chemical composition, and osmolarity of the chyme affect motility in the stomach and in the duodenum.
  - d. With respect to the processes of defecation:
    - i. Describe the defecation reflex and the function of the internal and external anal sphincters.
    - ii. Explain the effect of rectal distension in the defecation reflex.
    - iii. Discuss the conscious control of the defecation reflex.
    - iv. Discuss the specific role of the sympathetic and parasympathetic nervous system in the reflex.
    - v. Explain the Valsalva maneuver and the effects it has on the process of defecation and on the cardiovascular system.
- 5. Gross & microscopic anatomy of the accessory glands & organs
  - a. With respect to the salivary glands:
    - i. Describe the location of the parotid, submandibular, and sublingual glands and their respective ducts.
  - b. With respect to the liver:
    - i. Identify the hepatic artery, hepatic portal vein, and hepatic vein and discuss the function of each of those blood vessels.
    - ii. Identify the histological components of a liver lobule (including hepatocytes, hepatic sinusoids, Kupffer cells (hepatic macrophages), bile canaliculi, central vein, and the components of a hepatic triad) and discuss the function of each.
    - iii. Identify the hepatic duct, cystic duct, gallbladder, common bile duct, sphincter of the hepatopancreatic ampulla (ampulla of Vater and sphincter of Oddi) and discuss the roles of those structures in the flow of bile.
  - c. With respect to the pancreas:
    - i. Identify the head, body and tail of the pancreas
    - ii. Identify the pancreatic acini and discuss their functions.
    - iii. Identify the pancreatic islets and discuss their functions.
    - iv. Identify the pancreatic duct and the hepatopancreatic sphincter and discuss their roles in the flow of pancreatic enzymes.
- 6. Mechanical & chemical processes of digestion
  - a. With respect to mechanical digestion:
    - i. Define mechanical digestion.
    - ii. List the organs and structures of the digestive system that function in mechanical digestion and explain the details of the process for each.
  - b. With respect to chemical digestion:
    - i. Define enzymatic hydrolysis.

- ii. List the organs and structures of the digestive system that function in enzymatic hydrolysis.
  - iii. List the enzymes used in enzymatic hydrolysis.
  - iv. Discuss the activation of specific enzymes, where applicable.
  - v. List the substrates and products of enzymatic hydrolysis for each enzyme.
  - vi. Discuss the mechanisms used to regulate secretion and/or activation of each enzyme.
  - vii. Discuss the function, production, and regulation of secretion of hydrochloric acid (HCl).
- c. With respect to the process of emulsification:
- i. Define emulsification and describe the process.
  - ii. List the organs and structures of the digestive system that function in the process of emulsification.
7. Processes of absorption
- a. With respect to monosaccharides, peptides and amino acids, and fatty acids and monoglycerides:
  - b. List the organs and specific structures involved in the absorption of each of these types of nutrient.
  - c. Explain the processes involved in absorption of each type of nutrient.
  - d. Discuss the absorption of fat-soluble and water-soluble vitamins and the absorption of vitamin B<sub>12</sub>.
  - e. Discuss the enterohepatic circulation of bile salts.
8. Hormonal & neural regulation of digestive processes
- a. List the components of both a short reflex and a long reflex in the digestive system.
  - b. Discuss regulation of reflexes by the enteric nervous system and the parasympathetic nervous system.
  - c. Explain the effect of the cephalic phase of regulation on the mucous glands.
  - d. Explain the effect of the cephalic phase, gastric phase, and intestinal phase on the functions of the stomach and give examples for each phase.
- e. Explain the effect of the cephalic phase, gastric phase, and intestinal phase on the functions of the small intestine and give examples for each phase.
  - f. With respect to the following hormones or paracrine agents – gastrin, cholecystokinin, secretin, histamine:
    - i. State the organ or structure that produces each hormone or agent.
    - ii. State the target organ for each hormone or agent.
    - iii. Describe the action of each hormone or agent.
9. Application of homeostatic mechanisms
- a. Provide specific examples to demonstrate how the digestive system responds to maintain homeostasis in the body.
  - b. Explain how the digestive system relates to other body systems to maintain homeostasis.
10. Predictions related to homeostatic imbalance, including disease states & disorders
- a. Predict factors or situations affecting the digestive system that could disrupt homeostasis.
  - b. Predict the types of problems that would occur in the body if the digestive system could not maintain homeostasis.

## The Urinary System

*Alignment with Course Learning Outcome(s): 1, 2, 3*

1. General functions of the urinary system
  - a. Describe the major functions of the urinary system.
2. Gross & microscopic anatomy of the urinary tract, including detailed histology of the nephron
  - a. With respect to gross anatomy of the urinary tract:
    - i. Describe the external structure of the kidney, including its location, support structures and covering.
    - ii. Identify, and describe the structure and location of, the ureters, urinary bladder and urethra.
    - iii. Compare and contrast the male and female urethras.

- iv. Identify the major internal divisions and structures of the renal tissue.
    - v. Identify the major blood vessels associated with the kidney.
  - b. Trace the path of blood through the kidney.
  - c. With respect to the nephron and collecting system:
    - i. Identify the major structures and subdivisions of the renal corpuscles, renal tubules and renal capillaries.
  - d. Compare and contrast cortical and juxtamedullary nephrons.
    - i. Compare and contrast the structure and function of glomerular and peritubular capillaries.
    - ii. Identify the location, structures and cells of the juxtaglomerular apparatus.
  - e. With respect to the histology of the kidney:
    - i. Describe the histological structure of the proximal convoluted tubule, loop of Henle, distal convoluted tubule, and collecting duct.
    - ii. Distinguish histologically between renal cortex and medulla.
  - f. Trace the path of filtrate/urine from the renal corpuscle to the urethral opening.
- 3. Functional process of urine formation, including filtration reabsorption, & secretion
  - a. List the three major processes in urine formation and where each occurs in the nephron and collecting system.
  - b. With respect to filtration:
    - i. Describe the structure of the filtration membrane.
    - ii. Explain the anatomical features that create high glomerular capillary blood pressure and explain why this blood pressure is significant for urine formation.
    - iii. Describe the hydrostatic and colloid osmotic forces that favor and oppose filtration.
    - iv. Describe glomerular filtration rate (GFR), state the average value of GFR, and explain how clearance rate can be used to measure GFR.
  - v. Predict specific factors that will increase or decrease GFR.
  - c. With respect to reabsorption:
    - i. List specific transport mechanisms occurring in different parts of the nephron, including active transport, osmosis, facilitated diffusion, passive electrochemical gradients, receptor-mediated endocytosis, and transcytosis.
    - ii. List the different membrane proteins of the nephron, including aquaporins, channels, transporters, and ATPase pumps.
    - iii. Compare and contrast passive and active tubular reabsorption.
    - iv. Describe how and where water, organic compounds, and ions are reabsorbed in the nephron.
    - v. Explain why the differential permeability or impermeability of specific sections of the nephron tubules is necessary for urine formation.
    - vi. Explain the role of the loop of Henle, the vasa recta, and the countercurrent multiplication mechanism in the concentration of urine.
    - vii. State the percent of filtrate that is normally reabsorbed and explain why the process of reabsorption is so important.
  - d. With respect to tubular secretion:
    - i. List the location(s) in the nephron where tubular secretion occurs.
    - ii. Describe the physiological processes involved in eliminating drugs, wastes and excess ions.
  - e. Compare and contrast reabsorption and tubular secretion, with respect to direction of solute movement, strength of concentration gradients, and energy required.
  - f. Explain how the three processes in urine formation determine the rate of excretion of any solute.



- g. Compare and contrast blood plasma, glomerular filtrate, and urine and then relate their differences to function of the nephron.
  - h. Determine the physical and chemical properties of a urine sample and relate these properties to normal urine composition.
4. Factors regulating & altering urine volume & composition, including the renin-angiotensin system & the roles of aldosterone, antidiuretic hormone, & the natriuretic peptides
    - a. With respect to autoregulation:
      - i. Describe the myogenic and tubuloglomerular feedback mechanisms and explain how they affect urine volume and composition.
      - ii. Describe the function of the juxtaglomerular apparatus.
    - b. Describe how each of the following functions in the extrinsic control of GFR: renin-angiotensin mechanism, natriuretic peptides, and sympathetic adrenergic activity.
    - c. Describe how each of the following works to regulate reabsorption and secretion, so as to affect urine volume and composition: renin-angiotensin system, aldosterone, antidiuretic hormone, and natriuretic peptides.
    - d. Predict specific factors involved in creating dilute versus concentrated urine.
  5. Additional endocrine activities of the kidney
    - a. Describe the role of kidney in vitamin D activation.
    - b. Describe the role of kidney in regulating erythropoiesis.
  6. Innervation & control of the urinary bladder
    - a. Describe the function of the ureters, urinary bladder and urethra.
    - b. Describe the micturition reflex.
    - c. Describe voluntary and involuntary neural control of micturition.
    - d. Relate the anatomy and histology of the bladder to its function.
  7. Application of homeostatic mechanisms
    - a. Provide specific examples to demonstrate how the urinary system responds to maintain homeostasis in the body.
    - b. Explain how the urinary system relates to other body systems to maintain homeostasis.
  8. Predictions related to homeostatic imbalance, including disease states & disorders
    - a. Predict factors or situations affecting the urinary system that could disrupt homeostasis.
    - b. Predict the types of problems that would occur in the body if the urinary system could not maintain homeostasis.

## The Endocrine System

*Alignment with Course Learning Outcome(s): 1, 2*

1. General functions of the endocrine system
  - a. Describe the major functions of the endocrine system.
  - b. Define the terms hormone, endocrine gland, endocrine tissue (organ), and target cell.
  - c. Compare and contrast how the nervous and endocrine systems control body function, with emphasis on the mechanisms by which the controlling signals are transferred through the body and the time course of the response(s) and action(s).
2. Chemical classification of hormones & mechanism of hormone actions at receptors.
  - a. List the major chemical classes of hormones found in the human body.
  - b. Describe how each class is transported in the blood.
  - c. Compare and contrast the types of receptors (cell membrane or intracellular) that each class binds to.
  - d. Compare and contrast the mechanism of response that each class elicits (i.e., change in gene expression or change in an intracellular pathway via phosphorylation mechanism) and relate the response mechanism to the biochemical nature of the hormone molecule.
3. Control of hormone secretion

- a. List and describe several types of stimuli that control production and secretion of hormones.
  - b. Describe the roles of negative and positive feedback in controlling hormone release.
4. Control by the hypothalamus & pituitary gland
    - a. Describe the locations of and the anatomical relationships between the hypothalamus, anterior pituitary and posterior pituitary glands.
    - b. Define the terms releasing hormone, inhibiting hormone and tropic hormone.
    - c. Explain the role of the hypothalamus in the release of anterior pituitary hormones.
    - d. Explain the role of the hypothalamus in the production and release of posterior pituitary hormones.
  5. Identity, source, secretory control, & functional roles of the major hormones produced by the body \*\* Use the hormones below (grouped by organs) to perform outcomes a through d:
    - Pituitary: growth hormone, thyroid-stimulating hormone, luteinizing hormone, follicle stimulating hormone, prolactin, adrenocorticotrophic hormone, oxytocin, antidiuretic hormone (or vasopressin)
    - Pineal gland: melatonin
    - Thyroid gland: thyroxine, triiodothyronine, calcitonin
    - Parathyroid gland: parathyroid hormone
    - Adrenal gland: glucocorticoids (cortisol), mineralocorticoids (aldosterone), gonadocorticoids, epinephrine, norepinephrine
    - Testis: testosterone, inhibin
    - Ovary: estrogen, progesterone, inhibin
    - Pancreas: insulin, glucagon
    - Some may be covered in other modules:
      - Kidney: erythropoietin, calcitriol (Vitamin D)
      - Thymus: thymosin
      - Heart: atrial natriuretic peptide
      - Gastrointestinal tract: gastrin, secretin, cholecystokinin, motilin, gastric inhibiting peptide, ghrelin
      - Adipose tissue: leptin
      - Placenta: estrogen, progesterone, human chorionic gonadotropin
  - a. Describe the stimulus for release of the hormone.
  - b. Identify the gland or endocrine tissue/organ and the cells within that gland/tissue/organ that produce the hormone.
  - c. Name the target tissue or cells for the hormone and describe the effect(s) of the hormone on the target tissue or cells.
  - d. Predict the larger effect that fluctuations in the hormone level will have on conditions (variables) within the body.
6. Local hormones (paracrines & autocrines) & growth factors
    - a. Define the terms paracrine and autocrine.
  7. Hormonal response to stress
    - a. Describe the long and short term stress responses.
  8. Application of homeostatic mechanisms
    - i. Provide specific examples to demonstrate how the endocrine organs respond to maintain homeostasis in the body.
  9. Explain how the endocrine organs relate to other body organs and systems to maintain homeostasis.
  10. Predictions related to homeostatic imbalance, including disease states & disorders
    - a. Predict factors or situations affecting the endocrine organs that could disrupt homeostasis.
    - b. Predict the types of problems that would occur in the body if the various endocrine organs could not maintain homeostasis.

## The Reproductive System

*Alignment with Course Learning Outcome(s): 1, 2, 3, 4*

1. General functions of the male & female reproductive systems
  - a. Describe the major functions of the male and female reproductive systems.
2. Gross & microscopic anatomy of the male & female reproductive systems
  - a. With respect to the gross anatomy, identify and describe the anatomy of the male and female reproductive system, including the

- gonads, ducts, accessory glands, associated support structures, and external genitalia.
- b. With reference to microscopic anatomy:
    - i. Identify and describe the reproductive and supporting cells of the seminiferous tubules of the testis.
    - ii. Identify and describe the different stages of follicular development in the ovary, including the preovulatory follicle and the corpus luteum.
    - iii. Identify and describe the histology of the uterine wall.
3. Gametogenesis
    - a. Relate the general stages of meiosis to the specific processes of spermatogenesis and oogenesis.
    - b. Contrast the process and the final products of spermatogenesis and oogenesis.
  4. Specific roles of the female reproductive organs
    - a. Describe the pathway of the ovum from the ovary to the uterus.
      - i. Describe the ovarian cycle and relate the events of the ovarian cycle to oogenesis.
    - b. Describe the events of the uterine cycle.
    - c. Analyze graphs depicting the typical female monthly cycle and correlate ovarian activity, hormonal changes, and uterine events
  5. Specific roles of the male reproductive organs
    - a. Discuss the relationship between the location of the testes and sperm production.
    - b. Explain the role of the sustentacular cells and interstitial cells in sperm production.
    - c. Describe the pathway of sperm from the seminiferous tubules to the external urethral orifice of the penis.
    - d. Identify and describe the organs involved in semen production
    - e. Discuss the composition of semen and its role in sperm function.
  6. Regulation of reproductive system functions
    - a. State the functions of gonadotropin releasing hormone, follicle stimulating hormone, luteinizing hormone, inhibin, testosterone, estrogen and progesterone.
      - b. Compare and contrast endocrine regulation of spermatogenesis and oogenesis.
      - c. Compare and contrast the events and endocrine regulation of female and male puberty.
      - d. Define secondary sex characteristics and describe their role in reproductive system function.
      - e. Compare and contrast female and male sexual responses.
      - f. Define menopause, describe the physiological changes associated with menopause, and explain the fertility changes that precede menopause.
  7. Conception, pregnancy, & embryological & fetal development
    - a. Define fertilization and implantation
  8. Mammary glands & lactation
    - a. Describe the structure and the function of the mammary glands.
    - b. Describe the hormonal regulation of lactation.
  9. Application of homeostatic mechanisms
    - a. Provide specific examples to demonstrate how the reproductive system responds to maintain homeostasis in the body.
    - b. Explain how the reproductive system relates to other body systems to maintain homeostasis.
    - c. Predict factors or situations affecting the reproductive system that could disrupt homeostasis.
    - d. Predict the types of problems that would occur in the body if the reproductive system could not maintain homeostasis.

## **Heredity and Genetics**

*Alignment with Course Learning Outcome(s): 6. Explain Heredity and Genetic Control*

1. Define the terms chromosome, gene, allele, homologous, homozygous, heterozygous, genotype, and phenotype. (Blood Chapter - ABO blood typing; Reproduction Chapter – mitosis, meiosis)
2. Analyze genetics problems involving dominant and recessive alleles, incomplete dominance, codominance, and multiple alleles. (Blood Chapter -

ABO blood typing; Reproduction Chapter – mitosis, meiosis)

3. Discuss the roll of sex chromosomes in sex determination and sex-linked inheritance. (Reproduction Chapter – mitosis, meiosis)

**UNM Course Schedule for Bio 2225 Lecture AP2 Majors Fall 2023**

\* Since There are many drops in this course, there are no extensions.

WEEK	DATE	TOPICS and STUDY MATERIAL Reading Chapters are indicated for Amerman 2e	Turn in these <b>Graded Items</b> - available Thursday at 12am- Due: Sunday by 11:59 pm
1	8/21- 8/27	<p><b><u>To study this week:</u></b></p> <p>Start-up Week: Syllabus, .pdf Upload Assignment and Class Introductions</p> <p><b>Read:</b> Syllabus, start reading Ch. 19 Blood</p> <p><b>If you miss class, it might help watch:</b> Start Lectures YouTube Playlist: AP11 The Circulatory System - Blood</p> <p><b>Optional Practice:</b> Study Guide: Blood</p>	<p><b><u>To turn in this week for a grade:</u></b></p> <p>Due Sunday by 11:59 pm:</p> <p>1. Syllabus <b>Quiz</b></p>
2	8/28- 9/3	<p><b><u>To study this week:</u></b></p> <p><b>Read:</b> Ch. 19 Blood</p> <p><b>If you miss class, it might help to watch:</b> Lectures YouTube Playlist: AP11 The Circulatory System - Blood</p> <p><b>Optional Practice:</b> Study Guide: Blood</p>	<p><b><u>To turn in this week for a grade:</u></b></p> <p><b>Quiz 1 – Blood</b> is available from Thursday evening at 11:59pm and will remain available until <u>Sunday at 11:59pm.</u></p>
3	9/4- 9/10	<p><b><u>To study this week:</u></b></p> <p><b>Read:</b> Ch. 17 Heart</p> <p><b>If you miss class, it might help to watch:</b> Lectures YouTube Playlist: AP11 The Circulatory System - Heart</p> <p><b>Optional Practice:</b> Study Guides: Blood and Heart</p>	<p><b><u>To turn in this week for a grade:</u></b></p> <p><b>Quiz 2 – Heart</b> is available from Thursday evening at 11:59pm and will remain available until <u>Sunday at 11:59pm.</u></p>
4	9/11- 9/17	<p><b><u>To study this week:</u></b></p> <p><b>Exam Week!</b></p> <p><b>Study:</b> Study Guides for Blood and Heart</p> <p><b>If you miss class, it might help to watch:</b> Lectures YouTube Playlist: AP11 The Circulatory System – Blood and Heart</p>	<p><b><u>To turn in this week for a grade:</u></b></p> <p><b>Exam 1 – Blood and Heart</b> is available from Thursday evening at 11:59pm and will remain available until <u>Sunday at 11:59pm.</u></p>

		<b>Optional Practice:</b> Study Guides: Blood and Heart	
5	9/18-9/24	<p><b><u>To study this week:</u></b></p> <p><b>Read:</b> Ch. 18 Blood Vessels</p> <p><b>If you miss class, it might help to watch:</b> Lectures YouTube Playlist: APII Blood Vessels</p> <p><b>Optional Practice:</b> Study Guide: Blood Vessels</p> <p><b>Complete and post to Discussions:</b> Case study analysis for Discussion 1 post.</p>	<p><b><u>To turn in this week for a grade:</u></b></p> <p><b>Quiz 3 – Blood Vessels</b> is available from Thursday evening at 11:59pm and will remain available until <u>Sunday at 11:59pm</u></p>
6	9/25-10/1	<p><b><u>To study this week:</u></b></p> <p><b>Read:</b> Ch. 20 Lymphatic</p> <p><b>If you miss class, it might help to watch:</b> Lectures YouTube Playlist: APII Lymphatic</p> <p><b>Optional Practice:</b> Study Guide: Lymphatic Lite (only 5 pages)</p>	<p><b><u>To turn in this week for a grade:</u></b></p> <p><b>Quiz 4 – Lymphatic (Lite)</b> is available from Thursday evening at 11:59pm and will remain available until <u>Sunday at 11:59pm</u>.</p>
7	10/2-10/8	<p><b><u>To study this week:</u></b></p> <p><b>Exam Week!</b></p> <p><b>Study:</b> Study Guides for Blood Vessels and Lymphatic Lite (only 5 pages)</p> <p><b>If you miss class, it might help to watch:</b> Lectures YouTube Playlist: APII Blood Vessels and Lymphatic</p> <p><b>Optional Practice:</b> Study Guide: Blood Vessels and Lymphatic Lite (only 5 pages)</p>	<p><b><u>To turn in this week for a grade:</u></b></p> <p><b>Exam 2 – Blood Vessels and Lymphatic</b> is available from Thursday evening at 11:59pm and will remain available until <u>Sunday at 11:59pm</u>.</p>
8	10/9-10/15	<p><b><u>To study this week:</u></b></p> <p><b>Read:</b> Ch. 21 Respiratory (This one is an unusually complex subject so spend extra time here – you have 20 days until the Respiratory Exam)</p> <p><b>If you miss class, it might help to watch:</b> Lectures YouTube Playlist: APII Respiratory</p> <p><b>Optional Practice:</b> Study Guide: Respiratory</p>	<p><b><u>To turn in this week for a grade:</u></b></p> <p><b>Quiz 5 – Respiratory</b> is available from Thursday evening at 11:59pm and will remain available until <u>Sunday at 11:59pm</u>.</p>

9	10/16-10/22	<p><b><u>To study this week:</u></b></p> <p><b>Exam Week!</b></p> <p><b>Study:</b> Ch. 21 Respiratory, Study Guides for Respiratory</p> <p><b>If you miss class, it might help to watch:</b> Lectures YouTube Playlist: APII Respiratory</p> <p><b>Optional Practice:</b> Study Guide: Respiratory</p>	<p><b><u>To turn in this week for a grade:</u></b></p> <p><b>Discussion 1 Due – Case Study Analysis</b> Due Sunday by 11:59 pm</p> <p><b>Exam 3– Respiratory</b> is available from Thursday evening at 11:59pm and will remain available until <u>Sunday at 11:59pm.</u></p>
10	10/23-10/29	<p><b><u>To study this week:</u></b></p> <p><b>Read:</b> Ch. 24 Urinary</p> <p><b>If you miss class, it might help to watch:</b> Lectures YouTube Playlist: API Urinary</p> <p><b>Optional Practice:</b> Study Guide: Urinary</p>	<p><b><u>To turn in this week for a grade:</u></b></p> <p><b>Quiz 6 – Urinary</b> is available from Thursday evening at 11:59pm and will remain available until <u>Sunday at 11:59pm.</u></p>
11	10/30-11/5	<p><b><u>To study this week:</u></b></p> <p><b>Read:</b> Ch. 22 Digestive</p> <p><b>If you miss class, it might help to watch:</b> Lectures YouTube Playlist: APII Digestive</p> <p><b>Optional Practice:</b> Study Guide: Digestive</p> <p><b>Complete and post to Discussions:</b> Case Study Analysis Discussion 2</p>	<p><b><u>To turn in this week for a grade:</u></b></p> <p><b>Quiz 7– Digestive</b> is available from Thursday evening at 11:59pm and will remain available until <u>Sunday at 11:59pm.</u></p>
12	11/6-11/12	<p><b><u>To study this week:</u></b></p> <p><b>Exam Week!</b></p> <p><b>Study:</b> Ch 24 and 22 Study Guides for Urinary and Digestive</p> <p><b>If you miss class, it might help to watch:</b> Lectures YouTube Playlists: APII Urinary and Digestive</p> <p><b>Optional Practice:</b> Study Guides for Urinary and Digestive</p>	<p><b><u>To turn in this week for a grade:</u></b></p> <p><b>Exam 4 – Digestive and Urinary</b> is available from Thursday evening at 11:59pm and will remain available until <u>Sunday at 11:59pm.</u></p>

13	11/13-11/19	<p><b><u>To study this week:</u></b></p> <p><b>Read:</b> Ch. 16 Endocrine</p> <p><b>If you miss class, it might help to watch:</b> Lectures YouTube Playlist: APlI Endocrine</p> <p><b>Optional Practice:</b> Study Guide: Endocrine</p>	<p><b><u>To turn in this week for a grade:</u></b></p> <p><b>Quiz 8 -Endocrine</b> is available from Thursday evening at 11:59pm and will remain available until <u>Sunday at 11:59pm.</u></p> <p><b>Discussion 2 Due – Case Study Analysis</b> Due Sunday by 11:59 pm</p>
14	11/20-11/26	Thanksgiving	Thanksgiving
15	11/27-12/3	<p><b><u>To study this week:</u></b></p> <p><b>Read:</b> Ch. 26 Reproductive</p> <p><b>If you miss class, it might help to watch:</b> Lectures YouTube Playlist: APlI Reproductive</p> <p><b>Optional Practice:</b> Study Guides: Reproductive and Endocrine</p>	<p><b><u>To turn in this week for a grade:</u></b></p> <p><b>Quiz 9 – Reproductive System</b> is available from Thursday evening at 11:59pm and will remain available until <u>Sunday at 11:59pm.</u></p>
16	12/4-12/10	<b>Breathe.</b> You are almost there. Just study this week.	<b>Study Week – No Quiz or Exams.</b> <i>Just a break to slow it down before the Final Exam.</i>
17	12/11-12/17	<p><b>FINAL EXAM DUE <i>Thursday</i> by 11:59PM!!</b></p> <p>Final course grades post to LoboWeb by Tuesday at the latest</p>	<p><b><u>To turn in this week for a grade:</u></b></p> <p><b>Due THURSDAY by 11:59 pm</b></p> <p><b>The Final Exam</b> is available from Monday evening at 11:59pm <u>and is due Thursday, in the evening at 11:59pm.</u></p>

\*Topics or assignments may change as needed including any switch to remote options in the event of a prolonged campus closure. Announcements regarding such changes will be made during regular class hours. Students who are absent or tardy when such announcements are made will still be held accountable for the changes.