

BIO 50B Human Physiology Course Syllabus



Course Number: Biology 50B
Course Title: Human Physiology Lecture
Credits: 3 Units

Faculty Contact Information:

INSTRUCTOR: Dr. Kimberly Livas
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OFFICE HOURS: by appointment

Course Materials

REQUIRED TEXTBOOK and MODIFIED MASTERING A&P® SOFTWARE FOR LECTURE

1. Hardback Textbook: OR 1. Loose Leaf Textbook

Human Physiology (8th Edition)

By Silverthorn, Dee Unglaub

ISBN: 0134605195

ISBN-13: 9780134605197

Human Physiology (8th Edition)

By Silverthorn, Dee Unglaub

ISBN-10: 0134704207

ISBN-13: 978-0134704203

2. Digital Program:

Modified Mastering A&P® with Pearson eText -- Instant Access -- for Human Physiology: An Integrated Approach, 8th Edition

ISBN-13: 978-0134714868

ISBN-10: 0134714865

NOTE: In this course you will be using **Modified Mastering A&P®**, an online tutorial and homework program that accompanies your textbook. You need to purchase a separate access code for this course. The one you purchased for Bio50A will not work for Bio50B.

Technology Requirements

Hardware

- PC running Windows XP Service Pack 2+, Vista, Windows 7 or 8
OR
- Intel based Mac running OS X 10.6 or later;
- Monitor display resolution of at least 1280x720;
- Broadband connection with bandwidth of at least 768K/384K (downstream/upstream); and
- A microphone, web-cam (at least VGA (640x480) resolution), and speakers/headphones*.

* Hardware must meet the specified requirements of the web-cam.

Software

- **Google Chrome** browser version 26 or greater;
- Adobe Acrobat Reader version 10 or greater; and
- Javascript must be enabled in browser.
- Some functionality will require the following additional plugins:
 - Flash for media recording, streaming and viewing, as well as uploading files to a course or assignment; and
 - Java for screen sharing.
 - Microsoft Office recommended (Open tools OpenOffice or LibreOffice are valid substitutes)

TEACHING METHODS AND LEARNING ACTIVITIES: Teaching methods for this course will include lecture, discussion, participation and observation. Learning experiences include class participation as listener, contributor during lecture sessions, active participation in class assignments, and completion of course examinations.

ASSESSMENT OF STUDENT LEARNING OUTCOMES: Student learning is at the core of the MSMU mission. MSMU faculty developed a plan to assess student-learning outcomes that represent the knowledge, skills and attitudes expected of a pre-Nursing/Biology student. In this class one or more student learning outcomes will be assessed. Some of our class assignments may be used to evaluate overall student learning and to improve teaching and learning in this class, this department and throughout the University.

COURSE REQUIREMENTS

BIO 50B COURSE GRADE: Final grades are determined as a percentage of total points accumulated during the semester. Please note that this course is not graded on a curve. It is your responsibility to keep track of your grade and make an appointment with me if you are having problems or difficulties with the class. The grades for your assignments, exams and quizzes will be posted on Canvas as soon as they are

completed. You can determine your own grade in class at any time. ALL grades will be calculated to the nearest 4th number after the decimal point (for example all scores will be calculated as 73.0000).

DISTRIBUTION OF POINTS:

Midterm Exams (3)	60% (20% each)
Comprehensive Final exam	25%
Quizzes	10%
Homework(Mastering)	5%

**** Each student will also be required to meet one on one via zoom with the instructor at a minimum of 3 times throughout the course at the following designated points:**

Meeting 1: Within first two weeks of course

Meeting 2: After Exam one, but before Exam 2

Meeting 3: Within weeks 13-15 prior to final exam.

Also, These meetings will add points to your quiz category in regards to grades.

Course Requirements

- *Time Requirements.* This is a 3-credit-hour course and will require approximately 18 hours of focused effort every week over the 8-week course schedule to be completed successfully. Please schedule time for this course, along with other courses and individual responsibilities you may have accordingly.
- *Adaptive & Project-Based.* This course uses a combination of individualized, adaptive learning, and project-based learning strategies. As such, you will be expected to actively engage with the content of the course individually and also to collaborate actively with your peers every week.
- *Mastery.* You are required to demonstrate mastery of the concepts and terms presented within the course. You will demonstrate mastery by completing a series of quizzes and assignments designed to help you improve your proficiency with the terminology, concepts and skills presented in the course content.
- *Participation & Engagement.* You are expected to fully engage with your classmates, your instructor and the content of the course. Full engagement requires that you log into the online system and communicate meaningfully with your classmates at least five days each week. Doing so will make your learning experience more effective, more enjoyable, and ultimately, more successful.
- *Discussions and Groups.* A discussion is not a discussion if you only post and reply a couple of times a week, several days apart. Your group can only communicate and function at its best if everyone is present and actively involved. You are expected to

take personal responsibility for the success of your discussions and group work. Login, read and post to discussions and group projects at least three to four days per week, depending on the assignment expectations for the week. When the workload becomes more challenging, reach out to your classmates more often.

- *Writing expectations.* This is a rigorous, college-level course and you are expected to write at the college level in all of your assignments. Failure to proofread submissions for spelling and grammar will result in a significantly lower grade.

Quizzes and Exams will include information from any and all aspects of teaching (lecture, textbook, Mastering A&P resources) and will be comprehensive. The course builds day by day on what has already been presented hence the need for comprehensive and cumulative understanding. Questions normally are multiple choice, True/False, short answer questions and fill-in.

GRADING SCALE FOR THE COURSE:

A	90-100%	B	80-86.9%	C	70-76.9%
A-	89-89.9%	B-	79-79.9%	C-	69-69.9%
B+	87-88.9%	C+	77-78.9%	D	59-68.9%
F	< 58.9%				

NOTES ABOUT EXAMINATIONS:

- Quizzes and Exams in this class will be available via Canvas and will be proctored via Honorlock.
- **Make-up Midterm Exams and other Assignments** will be given ONLY in the event of a physician-documented illness, documented death in the family, or an official University event that prevents your attendance that day. You must contact me by email within 24 hours of a missed exam to inform me of your absence. IF for some reason students have to make up an assignment or test for an excused reason, students will automatically be deducted 10% penalty for their assignment/examination. No exceptions.
- **All exams are closed book** meaning that you can only have a pen or a pencil, blank paper and a calculator (if necessary) on the table when you take the exam.
- **All examinations are kept by the instructor.** Students may make appointments to view their examinations for learning purposes only.
- If you do not agree with a question marked incorrect, you may submit, in writing, an explanation of your reasoning and your request will be considered. You will have one week after receiving your exams back, to submit such request for re-grading. After that time, grades will be changed only if the score has been miscalculated.
- The minimum required grade to pass this course is a C.

STUDY RESOURCES: Bio50B covers a great deal of material. To help you learn the material and maximize your success in the class I suggest the following tips:

1. **Stay current on your reading – don't fall behind.**
2. **Do the Homework Assignments**
3. **Find a study partner or form a study group.**
4. **Use the Learning Center!! They have great tutors who can help you with the material covered in class as well as develop good study skills and strategies.**
5. **Use online resources, including those available on Mastering A&P.**

Program and Course Policies

Discussion Forum Guidelines

This course will require significant online interaction with your classmates. Please remember the following guidelines as you post and reply to your classmates.

- Review the discussion threads thoroughly before entering the discussion. Be a reader, then a respondent.
- Try to maintain threads by using the “Reply” button rather than starting a new topic.
- Do not make insulting or inflammatory statements to other members of the discussion group. Be respectful of others ideas.
- Be polite. Choose your words carefully. Do not use derogatory statements.
- Be patient and read the comments of other group members thoroughly before entering your remarks.
- Be positive and constructive in group discussions.
- Respond in a thoughtful and timely manner.

Late or missing assignments

All assignments and exams listed in the syllabus must be submitted to earn a passing grade in the course. Assignments and assessments are due according to the course schedule and syllabus. All students are expected to plan their time and energies so that course work can be completed and submitted on time.

If an emergency, medical or personal obstacle prevents you from meeting assignment expectations, you must contact your instructor as early as possible. At your instructor's discretion, assignments may be accepted after the due date, though late penalties may be assessed to your score. Except in extreme cases (as determined by your instructor), an assignment that is more than one week late will be accepted and will receive feedback, but will earn zero points towards your grade.

Due Dates and Times

Remember to check your time zone in the Canvas system. You can do this by clicking settings in the *top right corner*, then checking *Time Zone* in the *center* part of the page. All due date times are 11:59 pm Pacific Time. This means that if you are in a different time zone, the due date may appear to be later, since 11:59 pm PT on Wednesday is 12:59 am Mountain Time on Thursday, 1:59 Central Time on Thursday, and 2:59 Eastern Time on Thursday.

You may want to set your time zone in the Canvas system to Pacific Time. Then, you will always see the correct due date, and you do not need to worry about converting time zones.

Policy on Incompletes

An incomplete in a course can be granted only when a student has fulfilled the majority of the course requirements, has a passing grade in course work, is prevented from completing the assigned work for serious medical/personal reasons, and can, in the opinion of the instructor, complete the work within one eight-week session.

College Policies

Attendance and Engagement

Attendance and engagement are important for successful study, especially in an online class environment. Although you may not be required to appear in a classroom each week, you are expected to participate regularly in the online environment, to engage actively with the course content, with your classmates and with your instructor. In fact, early and regular participation in online classes is a significant predictor of student success.

Therefore, measures of student engagement and participation may be taken into account in determining academic grades. Students may be expected to explain to the instructor the reason for any absences from class activities and, in some cases, be asked to provide appropriate documentation. For more details, please see the Attendance policy in the *Student Handbook*.

BIOLOGY DEPT AND MOUNT SAINT MARY'S UNDERGRADUATE ACADEMIC POLICIES

All departmental policies and procedures will be followed in this course. Refer to the University Catalog and Student Handbook for the following issues: Academic Integrity/Plagiarism Statement, Attendance/Participation Policy, Learning Disability Statement, and Academic Freedom Statement.

Attendance Policy: Attendance is expected of each student for every class meeting. Attendance will be taken for the **entire semester**, and reported to the Registrar's Office if the student fails to attend class.

Disability Statement: Mount Saint Mary's University, Los Angeles is committed to ensuring the full participation of all students in its programs. If you have a documented disability (chronic, medical, physical, learning, psychological, or temporary), or think you may have a disability and need a reasonable accommodation to participate in class, complete course requirements, or access the University's programs or services; contact Disability Services (DS) as soon as possible. To receive an accommodation, you must register with DS. DS works with students confidentially and does not disclose any disability-related information without student consent. DS coordinates and promotes disability accommodations and awareness and works in partnership with faculty and all other student service offices. For further information about services for students with disabilities, contact DS at the Chalon Academic Support Center, H207, (310) 954-4142, or at the Doheny Student Resource Center, Building 3, (213) 477-2690. You can also email for more information at disability@msmu.edu.

Student Support Statement: Any student who has difficulty affording groceries or accessing sufficient food to eat every day, or who lacks a safe and stable place to live, and believes this may affect their performance in the course, is urged to contact the Dean of Student Life on their respective campus for support. Also, please notify the instructor. If you are on the Chalon Campus: Laura Crow, Dean of Student Life 310-954-4133 and lcrow@msmu.edu. Doheny Campus/WEC & Online/Sunset Gower/Graduate: Jessica Cuevas, Dean of Student Life 213-477-2570 and jcuevas@msmu.edu

Title IX Statement: Mount Saint Mary's University seeks to provide an environment that is free of bias, discrimination, and harassment. If you have been the victim of sexual harassment/misconduct/assault we encourage you to report such incidents in order to allow University to provide you with the appropriate on and/or off-campus services support should you choose. If you report this to a faculty member or any non-confidential employee of the University, as a "Responsible Employee", they must notify our University's Title IX coordinator about the basic facts of the incident (you may choose whether you or anyone involved is identified by name). For more information about your options at Mount Saint Mary's University, please go to: <https://mountsaintmarysuniversi.sharepoint.com/sites/MYMSMU/campus-resources/titleIX> (Links to an external site.)

Academic freedom statement: For faculty, academic freedom in research, teaching, and publication is fundamental to the advancement of truth and learning. Freedom of thought and expression is essential to fulfill the mission, and obligations, of academics and educators. The student has the freedom to express ideas that differ from any interpretation or any viewpoint presented by an instructor. In exercising this freedom, there should be no disruption of the academic process of the class. The student has the

right to be evaluated accurately and fairly on academic performance as outlined by the instructor at the beginning of the course. The student has the right to discuss and review any academic performance with instructors. A student who believes that an evaluation was made on a basis other than academic performance has the right to an appeal procedure. (For appeal procedures, see Student Handbook).

Academic Grievance: The Academic Grievance Committee shall receive and investigate complaints, excluding those pertaining to a learning disability (see College Disability Grievance Procedure) that have not been resolved on a lower level (Instructor and Department Chair/Program Director). Students have 14 business days from the posting of grades or dismissal notice to appeal a grade/standing in program. The burden of proof is on the student. A student who believes that the instructor made a clerical error in computing the grade or an egregious error of judgment in evaluating the student's performance has the right to an appeal procedure. For more information on the Academic Grievance Committee's jurisdiction, functions, and resolution process, see the Student Handbook. Email: AcademicGrievance@msmu.edu

DEI: Mount Saint Mary's University's commitment to Diversity, Equity and Inclusive Excellence stems from our CSJ heritage, Catholic identity, mission and values. We are compelled to always move toward profound love of God and love of neighbor without distinction. We are committed to diversity in all its possible forms with emphasis on the importance of human rights, equity, fairness, inclusiveness and diversity in the broadest sense including differences in gender, race, ethnicity, generational history, culture, socioeconomic class, religion, sexual orientation, national origin, citizenship status, political perspectives, geographic origin and physical ability. MSMU strives for inclusion and engagement with people from all walks of life and believes that multi-culturalism improves and enriches the learning, living and working environments for everyone at the Mount. See the [Center for DEI's myMSMU](#) page for more information and resources.

MSMU email account

Students are to maintain an MSMU email account and are expected to check it for communication from professor. Failure to read official communications sent to students' Mount email address does not absolve students from knowing and complying with the content of official communication.

Academic Integrity/Plagiarism Statements

Acts of academic dishonesty will not be tolerated, and are considered to be a serious offense. These acts include, but are not limited to, the following:

- Cheating of any kind. This includes copying, stealing or buying work that is not your own. It also includes sharing your own work with someone else for the intention of using that work as her own.
- Failing to hand in original work. This includes work gained from classmates, lab partners, other students, the Internet, etc. that is not acknowledged as a source or is not sanctioned by the instructor.

- Inappropriately or unethically uses technological means to gain an academic advantage – this includes inappropriately or unethically acquiring material via the Internet, or using hidden devices for communication during an exam.
- Plagiarism, which involves using anyone else's ideas and representing them as your own. Remember: always reference/cite properly!
- Falsification or misrepresentation of observations, data, sources of information
- Theft of any materials, academic or otherwise.

Violation of academic integrity, as stated in the MSMU catalog, will result in a zero grade for the assignment and/or an "F" for the course, and possible suspension from the University. The exact consequences of the violation will be determined on a case-by-case basis. The Biology department has outlined specific courses of action in order to deal with these violations and determine the consequences. They include, but are not limited to, informing students what is considered to be violations of academic integrity, notifying the student(s) they are suspected of a violation and discussing with them the consequences, and carrying through the discussed consequences if it is determined that a violation has occurred. Appeals can be made to the Academic Integrity Committee.

Student Services

Mount Saint Mary's University Online offers a full suite of student services to all of our online students. All student services begin with your personal Success Coach. Contact your coach first, who will help you get the assistance you need from other college services. Some of the most commonly needed student services include the following:

- Technology Help desk
- Disability Services
- Library Services
- Counseling Services

Specific information about each of these services can be found in the *Student Handbook*.

Technical Requirements

Technical requirements are listed in the *Student Handbook*. Before you begin this class, please ensure that your computer is up to date with the proper browser, plugins, microphone and video camera so that you can participate fully with your classmates.

Potential COVID-19 Disruption: Should the course modality change during the semester the instructor will provide a written comprehensive update of how the class will continue and any changes that may result.

University PPE Policy: All students must comply with the University personal protective equipment (PPE) policy while on campus. Non-compliant students will not be allowed to stay in class.

The Athenian Promise

A Commitment to Civility

Mount Saint Mary's University is committed to the advancement of learning and service to society. This is best accomplished in an atmosphere of mutual respect and civility, self-restraint, concern for others, and academic integrity. By choosing to join this community, I accept obligation to live by these common values and commit to the following principles.

As a Mount Saint Mary's University Student:

- I will embrace the concept of civil community which does not tolerate violence, theft, bigotry, or harassment of others in any form.
- I will commit myself to the pursuit of knowledge with personal integrity and academic honesty.
- I will respect the sanctity of the learning environment and avoid disruptive and deceitful behavior toward other members of the college community.
- I will support a culture of diversity by respecting the rights of those who differ from me.
- I will contribute to the development of a caring community where compassion for others and freedom of thought and expression are valued.
- I will honor, challenge and contribute to the scholarly heritage left by those who preceded me and work to leave this a better place for those who follow.

By endorsing these common principles, I pledge to contribute to a civil campus environment and resolve to encourage civil behavior in others. This is my promise to Mount Saint Mary's University and its community of scholars.

-Adapted with permission from the University of Pittsburgh's "Pitt Promise"

Disclaimer

The content of this syllabus may be altered to fit the specific needs of an individual student or group of students.

Bio50B Human Physiology: Student Learning Objectives (i.e., required concepts) for each chapter of the *Silverthorn and Hill, Human Physiology: An integrated approach, 8th ed.*

Chapter 1: *Introduction to Physiology*

1. Define Physiology
2. List the levels of organization from atoms to the biosphere.
3. Name the 10 physiological organ systems.

4. Define homeostasis. What happens when homeostasis fails?
5. Define clearance and give an example.
6. Distinguish between equilibrium and steady state.
7. List the three components of a control system and give an example.
8. Explain the relationship between a regulated variable and its setpoint.
9. Explain the relationship between a response loop and a feedback loop.
10. Compare negative feedback, positive feedback and feed forward control. Give an example of each.
11. Explain what happens to setpoints in biological rhythms and give some examples.

Chapter 2: *Molecular Interactions*

1. Compare and contrast the composition, structure, and functions of the four major groups of biomolecules.
2. Describe four important biological roles of electrons
3. Describe and compare the different types of covalent and noncovalent bonds.
4. Contrast the structure and solubility of polar and nonpolar molecules.
5. Describe the covalent and noncovalent interactions that contribute to molecular shape and explain how molecular shape is related to molecular function.
6. Define pH in words and mathematically and explain the differences between acids, bases and buffers.

Chapter 3: *Compartmentation: Cells and Tissues*

1. Name and describe the major body cavities and compartments.
2. Explain the four major functions of the cell membrane.
3. Draw and label the fluid mosaic model of the cell membrane and describe the functions of each component.
4. Compare a phospholipid bilayer to a micelle and a liposome.
5. Map the organizations of a typical animal cell.
6. Identify, name and list the functions of organelles found in animal cells.
7. Compare the structure and functions of the three families of cytoplasmic protein fibers.
8. Compare and contrast cilia and flagella.
9. Describe five major functions of the cytoskeleton.
10. Name the three motor proteins and explain their functions.
11. Describe the organization and function of the nucleus.

12. Explain how protein synthesis uses compartmentation in the cell to separate different steps of the process.
13. Describe the structure and functions of extracellular matrix.
14. Describe the role of proteins in the three major categories of cell junctions.
15. Compare the structures and functions of the four tissue types.
16. Describe the anatomy and functions of the five functional categories of epithelia.
17. Compare the anatomy and of the seven main categories of connective tissue.
18. Use structural and functional differences to distinguish between the three types of muscle tissue.
19. Describe the structural and functional differences between the two types of neural tissue.
20. Explain the differences between apoptosis and necrosis.
21. Distinguish between pluripotent, multipotent, and totipotent stem cells.

Chapter 4: *Energy and Cellular Metabolism*

1. Define energy. Describe three categories of work that require energy.
2. Distinguish between kinetic and potential energy, and describe potential energy in biological systems.
3. Explain the first and second laws of thermodynamics and how they apply to the human body.
4. Describe four common types of chemical reactions.
5. Explain the relationships between free energy, activation energy, and endergonic and exergonic reactions.
6. Explain what enzymes are and how they facilitate biological reactions.
7. Name and explain the four major categories of enzymatic reactions.
8. Explain the roles of the following molecules in biological energy transfer and storage: ADP, ATP, NADH, FADH₂, NADPH.
9. Outline the pathways for aerobic and anaerobic metabolism of glucose and compare the energy yields of the two pathways.
10. Explain how the electron transport system creates the high-energy bond of ATP.
11. Describe how the genetic code of DNA is transcribed and translated to create proteins.
12. Explain the roles of alternative splicing and posttranslational modification in protein synthesis.

Chapter 5: *Membrane Dynamics*

1. Explain how the body can be in osmotic equilibrium but electrical and chemical disequilibrium.
2. Compare and contrast molarity, osmolarity, osmolality, osmotic pressure, and tonicity.
3. List the rules for determining osmolarity and tonicity of a solution.
4. Compare bulk flow to solute movement across membranes.
5. Explain and compare simple diffusion, protein-mediated transport, and vesicular transport across membranes.
6. Explain the differences between diffusion in an open system and diffusion across biological membranes.
7. Compare movement through channels to movement on facilitated diffusion and active transport carriers.
8. Compare phagocytosis, endocytosis, and exocytosis.
9. Explain transcellular transport, paracellular transport, and transcytosis as they apply to epithelial transport.
10. Explain what it means for a cell to have a resting membrane potential difference.
11. Explain how changes in ion permeability change membrane potential, giving examples.

Chapter 6: *Communication, Integration and Homeostasis*

1. Describe three forms of local communication and two forms of long distance communication.
2. Explain the general sequence of events that follow lipophilic ligand binding to intracellular receptors.
3. Describe the general sequence of events that follow lipophobic ligand binding to a cell surface receptor.
4. Name and describe four major groups of cell surface receptors.
5. Explain how cascades and signal amplification play a role in signal transduction.
6. List five ways calcium acts as an intracellular messenger.
7. Know the seven steps of a reflex control pathway in the order in which they occur.
8. Describe some examples of complex reflex pathways with more than one integrating center.

Chapter 7: *Introduction to the Endocrine System*

1. Explain the four criteria that make a chemical signal a hormone.
2. Explain what the cellular mechanism of action of a hormone is.
3. List three chemical classes of hormones and give an example of each.

4. Compare the location of hormone receptors and the cellular mechanisms of action of peptide and steroid hormones.
5. Describe the role of the nervous system in endocrine reflexes.
6. Compare the structure and function of the anterior and posterior pituitaries.
7. List the six anterior pituitary hormones, the hormones that control their release, and their primary targets.

Chapter 8: *Neurons: Cellular and Network Properties*

1. Describe the organization of the nervous system in detail.
2. Explain the parts of a neuron and give their functions.
3. Describe the parts of a synapse and their functions.
4. Name the types and functions of glial cells.
5. Explain in words how the Goldman-Hodgkin-Katz equation relates to the membrane potential of a cell.
6. Explain the relationships between the following terms: current flow, conductance, resistance, Ohm's law.
7. Compare and contrast graded potentials and action potentials.
8. Explain the changes in ion permeability and ion flow that take place during an action potential.
9. Describe and compare absolute and relative refractory periods.
10. Explain the role of myelin in the conduction of action potentials.
11. Distinguish between electrical and chemical synapses.
12. List and give examples of the seven groups of neurotransmitter/neurocrine secretions.
13. Describe different patterns for neurotransmitter synthesis, recycling, release, and termination of action.
14. Describe the role of the following in synaptic communication: ionotropic and metabotropic receptors, neurotransmitters and neuromodulators, excitatory and inhibitory postsynaptic potentials (EPSPs and IPSPs).
15. Compare temporal and spatial summation.
16. Compare presynaptic and postsynaptic inhibition.

Chapter 9: *The Central Nervous System*

1. Define grey matter, white matter, tracts, and nuclei in the CNS.
2. Starting at the skull and moving inward, name the membranes and other structures that enclose the brain.

3. Explain the formation, distribution, and functions of cerebrospinal fluid.
4. Describe the structure and functions of the blood-brain barrier.
5. Explain how the following structures are organized in the spinal cord: ascending and descending tracts, columns, dorsal root ganglia, dorsal and ventral horns, dorsal and ventral roots, propriospinal tracts, spinal nerves
6. Name the major subdivisions of the cerebrum, cerebellum, diencephalon, and brain stem, and give their major functions.
7. Name the five lobes of the cerebral cortex and explain which sensory, motor, or association areas are associated with each lobe.
8. Describe the stages of sleep.
9. Explain the roles of Wernicke's area and Broca's area in written and spoken language.

Chapter 10: *Sensory Physiology*

1. Describe the different types of receptors for somatic and special senses.
2. Explain how receptors convert physical stimuli into electrical signals using the following terms: transduction, threshold, adequate stimulus, receptive field, receptor potential.
3. Explain how tonic and phasic receptors adapt to a continuous stimulus.
4. Trace the pathways for somatic sensation from receptor to the somatosensory cortex.
5. Describe the different types of somatosensory receptors.
6. Explain how pain and itch are mediated by nociceptors, and describe the neural pathways for pain.
7. Describe the receptors, sensory transduction, and neural pathways for olfaction.
8. Describe the receptors, sensory transduction, and neural pathways for the five primary taste sensations.
9. Trace the anatomical pathway sound energy follows from the air until it becomes an action potential in a primary sensory neuron.
10. Describe the anatomical pathway for sound transmission from the cochlea to the auditory cortex.
11. Explain how hair cells convert sound energy into an action potential.
12. Explain how otoliths and the cupula convey information about movement and head position to the vestibular nerve.
13. Describe the structures of the eye and the role of each structure in vision.
14. Trace the pathway for vision from the retina to the visual cortex.
15. Explain how photoreceptors convert light energy into action potentials.
16. Explain signal processing in the retina and in the visual cortex.

Chapter 11: *Efferent Division: Autonomic and Somatic Motor Control*

1. Describe the physiological role of the autonomic division and its branches.
2. Compare and contrast the anatomy and chemical communication of the sympathetic and parasympathetic branches.
3. Describe the synthesis and breakdown of autonomic neurotransmitters.
4. Describe the structure and secretions of the adrenal medulla.
5. Describe the structure of the neuromuscular junction.
6. Compare the anatomy, neurotransmitters and receptors of the somatic motor, sympathetic, and parasympathetic divisions.

Chapter 12: *Muscles*

1. Describe the different levels of organization of skeletal muscle.
2. Describe the sliding filament theory of contraction.
3. Describe the molecular events of excitation-contraction coupling and the contractile cycle.
4. Discuss the differences between slow-twitch fibers, fast-twitch oxidative glycolytic fibers, and fast-twitch glycolytic fibers.
5. Define a motor unit and explain how skeletal muscles use them to create graded contractions.
6. Compare and contrast isometric and isotonic contractions.
7. Describe smooth muscle anatomy.
8. Describe smooth muscle contraction and relaxation.

Chapter 13: Not covered in Lecture

Chapter 14: Cardiovascular Physiology

1. Describe the functions of the cardiovascular system and give examples of each function.
2. Describe the organization of the cardiovascular system, starting and ending in the aorta.
3. Define and explain the relationships among pressure, hydrostatic pressure, pressure gradients, flow, velocity of flow, resistance, and radius as they relate to the cardiovascular system.
4. Review the internal and external anatomy of the heart.
5. Describe the two types of myocardial cells and their arrangement in the heart.
6. Describe the membrane proteins and ion movement involved in myocardial excitation-contraction coupling and relaxation.
7. Compare and contrast actions potentials of myocardial autorhythmic and contractile cells.

8. Describe the conduction of electrical signals through the heart.
9. Describe the parts of an electrocardiogram and explain how these electrical events are related to the mechanical events of the cardiac cycle.
10. Explain the pressure changes that occur during the cardiac cycle and their relationship to flow through the heart and blood vessels.
11. Explain the relationship of heart rate, cardiac output, and stroke volume.
12. Explain the role of the autonomic divisions in control of heart rate at the cellular and molecular level.
13. Explain how preload, afterload, and contractility influence stroke volume.

Chapter 15: Blood Flow and the Control of Blood Pressure

1. Compare and contrast the structure, mechanical properties, and functions of the five major types of blood vessels.
2. Explain what creates blood pressure and how blood pressure changes as blood flows through the systemic circulation.
3. Describe how blood pressure is estimated using sphygmomanometry.
4. Explain the contributions of cardiac output and peripheral resistance to blood pressure. Calculate mean arterial pressure.
5. Explain how changes in blood volume affect blood pressure.
6. Define myogenic autoregulation and explain its role in altering local blood flow.
7. Explain how the body can use local and long-distance signaling to direct blood flow to or away from specific organs or tissues.
8. Describe in detail the steps of the baroreceptor reflex, including the stimulus, sensor, input pathway, integrating center(s), output pathways, target(s), cellular response(s), tissue responses(s) and systemic response(s). Include all chemical signaling molecules and their receptors as well as any feedback loops.
9. Explain the role of diffusion and transcytosis in capillary exchange.
10. Describe the anatomy and functions of the lymphatic system and how the lymphatics are related to the circulatory and immune systems.
11. List the controllable and uncontrollable risk factors for cardiovascular disease.

Chapter 16: Blood

1. Describe the composition of plasma and list the major functions of plasma proteins.
2. List the cellular elements of blood, including immature forms and subtypes, and describe the function(s) and distinguishing characteristics of each.
3. Describe the differentiation of blood's cellular elements.

4. List the components of a complete blood count.
5. Compare the structures of immature (reticulocyte) and mature (erythrocyte) red blood cells.
6. Describe the molecular structure of hemoglobin.
7. Describe the common pathologies of red blood cells.
8. Describe the production, structure, and functions of platelets.

Chapter 17: Mechanics of Breathing

1. List four major functions of the respiratory system.
2. Describe the anatomy of the respiratory system and explain the function of each structure.
3. Explain the relationship between the pressure of a gas and the volume in which it is contained.
4. Define and describe the lung volumes and lung capacities.
5. Explain how pressures and lung volumes change during normal breathing, and how that affects air flow in the respiratory system.
6. Compare and contrast compliance and elastance in respiratory physiology, giving examples of disease states that demonstrate changes in compliance and/ or elastance.
7. Explain the role of surface tension and surfactants in respiratory physiology.
8. Describe the role of the autonomic system in controlling bronchodilation and bronchoconstriction.
9. Compare and contrast total pulmonary ventilation and alveolar ventilation.
10. Explain the local control mechanisms by which ventilation and alveolar blood flow are matched.

Chapter 18: Gas Exchange and Transport

1. Describe how O_2 , CO_2 and pH influence ventilation.
2. Describe the normal partial pressures of O_2 and CO_2 in the atmosphere, alveoli, arterial blood, resting cells, and venous blood.
3. Explain the difference between the concentration of a gas in solution and the partial pressure of that gas in solution, using O_2 and CO_2 as examples.
4. Explain the role of hemoglobin in oxygen transport from the molecular level to the systemic level.
5. Describe the relationship between plasma PO_2 and oxygen transport.
6. Write the chemical reaction for the Conversion of CO_2 to HCO_3^- , including the enzyme that catalyzes the reaction.
7. Describe the transport of carbon dioxide in arterial and venous blood, including the exchanges of CO_2 between the blood and the alveoli or cells.

Chapter 19: The Kidneys

1. Describe the six functions of the kidneys.
2. Trace the anatomical path of a drop of water from Bowman's capsule to urine leaving the body.
3. Trace a drop of blood from the renal artery to the renal vein.
4. Diagram the anatomical relationship between the vascular and tubular elements of the nephron.
5. Describe the three processes of the nephron.
6. Explain the changes in the volume and osmolarity of filtrate as it passes through each section of the nephron.
7. Describe the filtration barriers between the blood and the lumen of the nephron, and explain how they can be modified to control filtration.
8. Define glomerular filtration rate and give average values for GFR.
9. Explain and give examples of the importance of tubular secretion in renal function.
10. Explain mathematically and in words the relationship between the excretion of a solute
11. Describe the involuntary micturition reflex and include the voluntary control pathway exerted by higher brain centers.

Chapter 20: Not covered in Lecture

Chapter 21: The Digestive System

1. Describe the digestive tract
2. Describe the primary function of the digestive system.
3. Describe and compare secretion, digestion, absorption, and motility.
4. Describe and compare peristalsis, segmentation, and the migrating motor complex.
5. Explain feedforward control in digestion.
6. Explain the functions of saliva and the process by which it is secreted.
7. Explain the functions of the stomach.
8. Compare and contrast digestion and motility in the large and small intestine.
9. Describe the anatomy and function of the hepatic portal system.
10. Describe the major secretions of the pancreas and liver.

Chapter 22: Not Covered in Lecture

Chapter 23: Not covered in Lecture

Chapter 24: Cardiovascular Physiology

1. List the major functions of the immune system.
2. Describe the differences between bacteria and viruses that require a variety of defense mechanisms.
3. Briefly describe the difference between innate immunity and acquired immunity.
4. Describe and differentiate between different types of primary lymphoid tissues and secondary lymphoid tissues.
5. Review the morphological and functional characteristics of leukocytes.
6. Describe the relationships between the immune, nervous, and endocrine systems.
7. Explain how stress affects immunity.

Chapter 25: Not covered in Lecture

Chapter 26: Reproduction and Development

1. Describe the role of sex chromosomes in sex determination
2. Describe the common hormonal control and feedback pathways for reproductive function.
3. Review the internal and external anatomy of the adult male reproductive and accessory structures and give the function(s) of each.
4. Briefly describe the process and timeline of spermatogenesis and oogenesis.
5. Describe the primary and secondary sex characteristics of the male and the hormones that influence their development.
6. Review the internal and external anatomy of the adult female reproductive and accessory structures and give the function(s) of each.
7. Describe the ovarian and uterine stages of the menstrual cycle.
8. Describe the secondary sex characteristics of the female and the hormones that influence their development.
9. Explain the anatomy or physiology of currently available contraceptive methods.
10. Describe the process of sperm capacitation and fertilization of an ovum.
11. Describe the process of embryo development from fertilization through implantation in the endometrium.
12. Describe how the reproductive systems of males and females change at puberty and with menopause and andropause.

