Cuyahoga Community College Official Statement on Academic Quality:
Cuyahoga Community College is committed to academic quality characterized by an educational climate that is rigorous and disciplined, has high expectations, requires hard work, expects personal and professional integrity, recognizes the dignity and worth of all persons, and provides support for teaching, learning and scholarship.

BIOLOGY 2331 ANATOMY AND PHYSIOLOGY I
Lecture (50890): 10:15 am until 12:20 pm on M & W in EHCT-21 (3 lecture hours; 3 credit hours)
Laboratory (50894): 12:30 until 2:35 pm on M & W in EHCT 231 (3 lab hours; 1 credit hour)

TERM Full Term Summer Semester 2019

INSTRUCTOR Lou Rifici
Assistant Professor of Biology/Environmental, Health and Safety Technology
On Campus: Office: EHCT 211H, (216) 987-2097, voice mail available
E-mail: louis.rifici@tri-c.edu
My Personal Web Site: http://cccprofessorlou.com
Office Hours: M & W: 9:30 - 10:00 am and 2:30 – 4:00 pm; Or by appointment

BIO 2331 CATALOG DESCRIPTION: "Study of structure and function of human body. Focus on fundamental concepts of cellular structure, tissues, organs, and systems. Considers structure, function, and terminology of skeletal, muscular, integumentary, nervous and endocrine systems. Laboratory experiences include demonstrations, microscopic observations, anatomic models, and videos related to topics."

Course Outcomes and Objectives are found at the end of this syllabus.

PREREQUISITE BIO - 1100 Introduction to Biological Chemistry, or Sufficient score on Biology Placement Test or CHEM - 1010 Introduction to Inorganic Chemistry and CHEM - 1020 Introduction to Organic Chemistry and Biochemistry; or BIO - 1500 Principles of Biology I.

NEEDED BOOKS AND MATERIALS
   **In the bookstore, this book is identified as Custom Edition for Cuyahoga Community College Human Anatomy and Physiology.**
4. Colored pencils are recommended for lab.
5. Regular access to a computer with reliable, efficient Internet connection.

ACADEMIC CREDIT Academic Credit According to the Ohio Department of Higher Education, one (1) semester hour of college credit will be awarded for each lecture hour. Students will be expected to work on out-of-class assignments on a regular basis which, over the length of the course, would normally average two hours of out-of-class study for each hour of formal class activity. For laboratory hours, one (1) credit shall be awarded for a minimum of three laboratory hours in a standard week for which little or no out-of-class study is required.
since three hours will be in the lab (i.e. Laboratory 03 hours). Whereas, one (1) credit shall be awarded for a minimum of two laboratory hours in a standard week, if supplemented by out-of-class assignments which would normally average one hour of out-of class study preparing for or following up the laboratory experience (i.e. Laboratory 02 hours). Credit is also awarded for other hours such as directed practice, practicum, cooperative work experience, and field experience. The number of hours required to receive credit is listed under Other Hours on the syllabus. The number of credit hours for lecture, lab and other hours are listed at the beginning of the syllabus. Make sure you can prioritize your time accordingly. Proper planning, prioritization and dedication will enhance your success in this course. The standard expectation for an online course is that you will spend 3 hours per week for each credit hour.

DETERMINING YOUR FINAL GRADE

Reading Assignments
1. Read the assigned textbook and laboratory pages in PREPARATION FOR CLASS. This is a standing homework assignment and is the key to getting the highest grade.
2. Determine your reading assignments, lecture topics, and lab topics using the Schedules attached.
3. All lecture readings are in Human Anatomy and Physiology, 11th ed. by Marieb and Hoehn unless noted otherwise.

Lecture Tests:
1. Four tests. Final test is not cumulative.
2. Tests will consist of a variety of question types including multiple choice, matching, diagram interpretation, and written answer. EXAMPLE lecture tests located at the class web page.
   a. Questions requiring a written response will include those testing your knowledge and understanding of course outcomes and objectives listed in the Course Description above. Such questions may carry a higher point value and require a lengthier response than other written answer questions present on the test.
3. Please see my Lecture Test Grading Policy at the course web page.
4. About 2 sheets of lined paper are provided for responding to written answers. Any additional paper brought in by you must be displayed on the desktop and ready for inspection when the test begins. I reserve the right to inspect both sides of each sheet of paper before or during the test. All additional paper brought into the test room must be blank at the start of the test.

Laboratory Tests:
1. Five tests. Final Test is not cumulative.
2. A typical test consists of 50 questions in a "lab practical" format.
3. Laboratory tests will test primarily for memorization of anatomy. Understanding of the laboratory activities and the supporting text explanations help you learn the anatomy in the context of function.
4. Please see my Lab Test Grading Policy located at the course web page.

The test environment must be quiet and free from distractions:
1. ABSOLUTELY no phone use.
2. The following are the only materials that may be on your desktop while you have the test in your possession:
   a. test sheets handed to you
   b. Scantron form, if used
   c. additional writing implements, erasers, pencil sharpeners
   d. drink and/or light snack (NOT IN THE LABORATORY)
3. Please store your other possessions on nearby chairs, window sills, unoccupied desktops well away from your location, or other storage location.
**Computer-Based Lecture and Laboratory Homework:**

Homework is completed electronically using the web-based app, *Modified Mastering A&P*, developed by your textbook publisher Pearson Education Inc. You will use an access code to register for and login to *Mastering A&P*. **Use of Modified Mastering A&P is REQUIRED for this course.**

The *Modified Mastering A&P* access code comes bundled with your textbook when you purchase through the Eastern Campus Bookstore. If you get your textbook from somewhere other than the campus bookstore, you may need to purchase the access code separately, either at the bookstore or on-line.

If you purchase *Modified Mastering A&P* separately, you will have the option of purchasing it with or without access to an eText to supplement or even replace the required textbook for this course.

Once you obtain your *Modified Mastering A&P* access code, use the link provided at the COURSE WEB PAGE to navigate to the registration page. Click “Register Now.” To register for the first time, you need an e-mail, the course ID (see below), and your access code (comes with your textbook or purchased separately). If you used *Modified Mastering A&P* or in a previous attempt of A&P I, use your userid and password to log-in to the website and sign-in to my site using the Course ID below.

The course ID this semester is: rifici17528

*Modified Mastering A&P’s Lecture Assignments* will ask you questions about text chapter concepts using a helpful interactive computer interface called *Dynamic Study Modules*. HOMEWORK DUE DATES ARE LISTED IN THE SYLLABUS SCHEDULE. Incomplete assignments are graded on a pro-rated basis. Twenty-two Dynamic Study Modules are offered. The lowest FOUR scores will be dropped. *Modified Mastering A&P’s* Calendar lists each assignment and exactly when it is due.

*Modified Mastering A&P’s Laboratory Assignments* will help you prepare for laboratory and improve your success in lab. ALL LABORATORY HOMEWORK IS DUE BEFORE CLASS ON THE DUE DATE LISTED IN THE SYLLABUS SCHEDULE. Late assignments will not be accepted so please get them in on time. Fifteen pre lab assignments are offered. The lowest FIVE scores will be dropped. *Modified Mastering A&P’s* Calendar lists each assignment and exactly when it is due.

<table>
<thead>
<tr>
<th>GRADING</th>
<th>Number</th>
<th>Point Value</th>
<th>Total Points</th>
<th>% of Final Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture Tests</td>
<td>4</td>
<td>250</td>
<td>1000</td>
<td>55</td>
</tr>
<tr>
<td>Dynamic Study Modules</td>
<td>18</td>
<td>12.5</td>
<td>225</td>
<td>12</td>
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<tr>
<td>Lab Tests</td>
<td>5</td>
<td>100</td>
<td>500</td>
<td>27.5</td>
</tr>
<tr>
<td>Pre Lab Homework</td>
<td>10</td>
<td>10</td>
<td>100</td>
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<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>1825</strong></td>
<td><strong>100</strong></td>
<td></td>
</tr>
</tbody>
</table>

**GRADING SCALE**  
A = >1643 points (90%), B = 1460 to 1642 points (80%), C = 1277 to 1459 points (70%), D = 1095 to 1266 points (60%), F = <1095 points

Departmental Policy: In order to pass BIO-2331, you must earn at least a 60% in both lecture and lab.

**ATTENDANCE AND MAKEUP POLICY**  
The College Policy says:
"Regular class attendance is expected. Tri-C is required by law to verify the enrollment of students who participate in federal Title IV student aid programs and/or who receive educational benefits through other funding sources. Eligibility for federal student financial aid is, in part, based on your enrollment status."
Students who do not attend classes for the entire term are required to withdraw from the course(s).
Additionally, students who withdraw from a course or stop attending class without officially withdrawing may be required to return all or a portion of the financial aid based on the date of last attendance. Students who do not attend the full session are responsible for withdrawing from the course(s).

Tri-C is responsible for identifying students who have not attended a course, before financial aid funds can be applied to students’ accounts. Therefore, attendance will be recorded in the following ways:

For in-person courses, students are required to attend the course by the 15th day of the semester, or equivalent for terms shorter than 5-weeks, to be considered attending. Students who have not met all attendance requirements for an in-person course, as described herein, within the first two weeks of the semester, or equivalent, will be considered not attending and will be reported for non-attendance and dropped from the course.

At the conclusion of the first two weeks of a semester, or equivalent, instructors report any registered students who have “Never Attended” a course. Those students will be administratively withdrawn from that course. However, after the time period in the previous paragraphs, if a student stops attending a class, wants or needs to withdraw, for any reason, it is the student's responsibility to take action to withdraw from the course. Students must complete and submit the appropriate Tri-C form by the established withdrawal deadline.

Tri-C is required to ensure that students receive financial aid only for courses that they attend and complete. Students reported for not attending at least one of their registered courses will have all financial aid funds held until confirmation of attendance in registered courses has been verified. Students who fail to complete at least one course may be required to repay all or a portion of their federal financial aid funds and may be ineligible to receive future federal financial aid awards. Students who withdraw from classes prior to completing more than 60 percent of their enrolled class time may be subject to the required federal refund policy.

If illness or emergency should necessitate a brief absence from class, students should confer with instructors upon their return. Students having problems with class work because of a prolonged absence should confer with the instructor or a counselor."

My Policy is:
YOU ARE NOT ENTITLED TO MAKE UP MISSED TESTS AND/OR ASSIGNMENTS.
• Completing your tests at the scheduled time and place must be a priority.
• ONLY PERSONAL ILLNESSES OR PERSONAL EMERGENCIES are valid reasons for missing tests.
• It is your responsibility to alter your personal schedule so you do not miss tests. Computer-based homework may be completed any time before the due date.
• According to Princeton’s Wordnet, an emergency is a sudden unforeseen crisis (usually involving danger) that requires immediate action.
• Vacations and non-emergency hospital visits should not interfere with completing tests and assignments.

If you miss a test for a valid reason:
1. Call or write me WITHIN 24 HOURS of the missed test. – THERE ARE NO EXCEPTIONS TO THIS RULE.
   • Give me the reason for your absence
   • Receive instructions about taking the make up test
   • Schedule your make up
2. Take the make up test at the scheduled time and place
  - There is one make up test date, July 31, 2019.

Also note: I will decide the content of each make up test. No other graded assignments (in-class or out of
class) may be made up. **Abuse of the make up policy can lead to it being revoked.** Due to the lack of open
lab time, laboratory exercises may not be made up.

**LEARNING RESOURCE CENTER** Tutors for biology classes are available in ESS-1108 (987-2256). Check there for
hours and availability. If you decide to use a tutor, seek one as soon as possible, make regular visits, and come
prepared for each visit. I am available to **tutor** you by appointment.

**ACADEMIC MISCONDUCT** Any student found to have committed or to have attempted to commit any act of
dishonesty, including cheating, plagiarism, or other forms of academic dishonesty, is subject to the disciplinary
sanctions outlined in the Student Judicial System.

Refer to the Student Conduct Code 3354:1-30-03.5 and Student Judicial System 3354:1-30-03.6 for more
information about violations and College disciplinary procedures. The Student Conduct and Academic Honor
code can be accessed via My Tri-C Space on the Student Services tab. The policies are located in the College
Guidelines channel located near the bottom of the page.

**ESTABLISHING AND MAINTAINING A HEALTHY CLASSROOM ENVIRONMENT** All of us must work to establish
and maintain a classroom environment that is inviting, inclusive, and supports learning. Please read my
specific **Rules for the Classroom** located at the class webpage:

**WITHDRAWAL POLICY** Regular class attendance is expected. Tri-C is required by law to verify the enrollment
of students who participate in Federal Title IV student aid programs and/or who receive educational benefits
through other funding sources. Tri-C is responsible for identifying students who have not attended or logged
into a class for which they are registered. At the conclusion of the first two weeks of a semester, instructors
may report any registered students who have "Never Attended" a class so that those reported students will be
administratively withdrawn from that class. However, it is the student's responsibility to withdraw, using the
appropriate Tri-C form, from any class which she/he is no longer attending or risk receiving a failing grade in
that class. Student's wishing to withdraw must complete and submit the appropriate Tri-C form by the
established withdrawal deadline. **The last day to withdraw from this course is July 19, 2019.**

**INCOMPLETE POLICY** Instructors determine grades, subject to the College’s policies and procedures. A
notation of “I” indicates that a student has not completed all course requirements because of circumstances
**judged by the instructor** to be beyond the student’s control. Failure to complete such requirements no later
than the end of the fifth full week of the next semester will result in an “F” (Failing) grade.

**YOUR PRIVACY** Federal law and College Policy prohibit me from discussing your current and final grades with
anyone but you. Therefore, I am unwilling to give grade information over the phone or via e-mail. Please
utilize my office hours to discuss current and final grades with me.

**CAMPUS POLICE AND SECURITY SERVICES** are dedicated to protecting life and property, while detecting and
preventing crime. The department includes police officers, detective bureau, K-9 patrol, security officers,
dispatchers, administrative staff, and student patrols.

FOR ASSISTANCE OR TO REPORT A CRIME CALL:  Non-emergencies:  216-987-4325
When on campus always take note of the two nearest exits and emergency signs in all classrooms. If there is an emergency alarm informing all to evacuate or a fire alarm, immediately take your personal belongings with you. Do not reenter the building until notified by emergency personnel. If there is an alarm for seeking shelter due to inclement weather, go to the lowest level and stay away from windows. Follow the directions of the announcements. A “Lock Down” announcement will require all campus members to stay in the building and not to evacuate/leave.

**CONCEALED CARRY STATEMENT** College policy prohibits the possession of weapons on college property by students, faculty and staff, unless specifically approved in advance as a job-related requirement (i.e., Tri-C campus police officers) or, in accordance with Ohio law, secured in a parked vehicle in a designated parking area only by an individual in possession of a valid conceal carry permit.


**ACCESSIBILITY STATEMENT** If you need any special course adaptations or accommodations because of a documented disability, please notify your instructor within a reasonable length of time, preferably the first week of the term with formal notice of that need (i.e. an official letter from the ACCESS office). Accommodations will not be made retroactively.

**RECYCLING ON CAMPUS** Please use the recycling bins located on campus to dispose of your cans, bottles, and paper. Do not place trash or non-recyclable materials into the recycling bins. Be a part of this important effort to conserve resources and reduce pollution.
<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Day</th>
<th>Lecture Topic</th>
<th>Reading Assignment</th>
<th>Dynamic Study Module #</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5/27</td>
<td>M</td>
<td>Memorial Day – College Closed</td>
<td>---</td>
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</tr>
<tr>
<td></td>
<td>5/29</td>
<td>W</td>
<td>Orientation to Human Biology and the Science of Anatomy and Physiology; Human Cell Biology (Do you need to review basic chemistry? Read Chapter 2)</td>
<td>Ch 1: 1-12; Ch 3: 60-96</td>
<td>---</td>
</tr>
<tr>
<td>2</td>
<td>6/3</td>
<td>M</td>
<td>Human Cell Biology, continued</td>
<td>&quot;</td>
<td>Ch. 03 (2) – 6/19</td>
</tr>
<tr>
<td></td>
<td>6/5</td>
<td>W</td>
<td>Tissues and Basics of Inflammation and Tissue Repair</td>
<td>Ch 4: 115-146</td>
<td>Ch. 04 – 6/19</td>
</tr>
<tr>
<td>3</td>
<td>6/10</td>
<td>M</td>
<td>Tissues, continued</td>
<td>&quot;</td>
<td>Ch. 05 (2) – 7/8</td>
</tr>
<tr>
<td></td>
<td>6/12</td>
<td>W</td>
<td>Integumentary System (covered on Test 2)</td>
<td>Ch 5: 150-169</td>
<td>Ch. 02 – 7/8</td>
</tr>
<tr>
<td>4</td>
<td>6/17</td>
<td>M</td>
<td>Bones and Skeletal Tissues (covered on Test 2)</td>
<td>Ch 6: 173-194; Ch 8: 251-258, 270-272 (264-270 optional)</td>
<td>Ch. 06 (2) – 7/8 Ch. 08 – 7/8</td>
</tr>
<tr>
<td></td>
<td>6/19</td>
<td>W</td>
<td>LECTURE TEST 1 (does not include Integumentary or Skeleton) Lecture topic: Skeleton, continued</td>
<td>---</td>
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</tr>
<tr>
<td>5</td>
<td>6/24</td>
<td>M</td>
<td>Muscle Tissue, Contraction, and Physiology</td>
<td>Ch 9: 279-317</td>
<td>Ch. 09 (2) – 7/8</td>
</tr>
<tr>
<td></td>
<td>6/26</td>
<td>W</td>
<td>Fundamentals of the Nervous System and Nervous Tissue (covered on Test 3)</td>
<td>Ch 11: 390-428</td>
<td>Ch. 11 (2) – 7/17</td>
</tr>
<tr>
<td>6</td>
<td>7/1</td>
<td>M</td>
<td>Nervous Tissue, continued</td>
<td>&quot;</td>
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<tr>
<td></td>
<td>7/3</td>
<td>W</td>
<td>Central Nervous System: Brain (covered on Test 3)</td>
<td>Ch 12: 434-470</td>
<td>Ch. 12 (3) – 7/17</td>
</tr>
<tr>
<td>7</td>
<td>7/8</td>
<td>M</td>
<td>LECTURE TEST 2 (does not include Nervous System/Tissue, CNS) Lecture topic: Central Nervous System: Spinal Cord</td>
<td>Ch 12: 470-484</td>
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<tr>
<td></td>
<td>7/10</td>
<td>W</td>
<td>Peripheral Nervous System and Reflex Activities</td>
<td>Ch 13: 489-508, 515-525 (508-515 optional)</td>
<td>Ch. 13 (2) – 7/17</td>
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<tr>
<td>8</td>
<td>7/15</td>
<td>M</td>
<td>Autonomic Nervous System</td>
<td>Ch 14: 528-548</td>
<td>Ch. 14 – 7/31</td>
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<td></td>
<td>7/17</td>
<td>W</td>
<td>LECTURE TEST 3 Lecture topic: Autonomic Nervous System, continued</td>
<td>&quot;</td>
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<tr>
<td>9</td>
<td>7/22</td>
<td>M</td>
<td>Special Senses</td>
<td>Ch 15: 553-595</td>
<td>Ch. 15 (2) – 7/31</td>
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<tr>
<td></td>
<td>7/24</td>
<td>W</td>
<td>Special senses, continued</td>
<td>&quot;</td>
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<tr>
<td>10</td>
<td>7/29</td>
<td>M</td>
<td>Endocrine System</td>
<td>Ch 16: 601-635</td>
<td>Ch. 16 (2) – 7/31</td>
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<td></td>
<td>7/31</td>
<td>W</td>
<td>LECTURE TEST 4 – All Students</td>
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</table>

(2) = two Dynamic Study Modules are assigned – See Mastering A&P website for more information
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<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Day</th>
<th>Laboratory Topic</th>
<th>Lab Exercise</th>
<th>HELP</th>
<th>Homework – Due BEFORE Lab Begins</th>
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</thead>
<tbody>
<tr>
<td>1</td>
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<td>Memorial Day – College Closed</td>
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<td></td>
<td>5/29</td>
<td>W</td>
<td>Introduction to A&amp;P Lab; Body Organization and Terminology</td>
<td>Exercise 1: 1-12</td>
<td>Marieb: 11-20</td>
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<tr>
<td>2</td>
<td>6/3</td>
<td>M</td>
<td>Care and Use of the Microscope; Cell Structure</td>
<td>2: 16-24</td>
<td>M: 62; 94-96</td>
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<td>6/5</td>
<td>W</td>
<td>Human Tissues</td>
<td>5: 48-66</td>
<td>M: 118-140</td>
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<td></td>
<td>6/10</td>
<td>M</td>
<td>Complete Tissues; Integumentary System and Sensors of the Skin</td>
<td>6: 72-80</td>
<td>M: 150-154; 485-486</td>
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<tr>
<td></td>
<td>6/12</td>
<td>W</td>
<td>Introduction to the Skeletal System; Axial Skeleton: Cranium</td>
<td>7: 84-89</td>
<td>Table 6.1</td>
<td>Prelab #1 #2</td>
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<td></td>
<td>6/17</td>
<td>M</td>
<td>Lab Test One</td>
<td>7: 98-106</td>
<td>M: 218-227</td>
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<td></td>
<td>6/19</td>
<td>W</td>
<td>Appendicular Skeleton: Pectoral Girdle and Upper Limb</td>
<td>8: 112-117; 144-145</td>
<td>M: 227-236</td>
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<tr>
<td></td>
<td>6/26</td>
<td>W</td>
<td>Movements of the Skeleton; Introduction to Skeletal Muscle; Muscles of the Head, Neck and Trunk (all topics covered on Test 3)</td>
<td>9: 134-137 &amp; Handout 10: 154-157 11: 164-175; 186-189</td>
<td>M: 258-260; M: 286-287 Figure 9.2 M: 331-364</td>
<td>#4 #5</td>
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<td>3</td>
<td>7/1</td>
<td>M</td>
<td>Lab Test Two</td>
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<tr>
<td></td>
<td>7/3</td>
<td>W</td>
<td>Muscles of the Upper Limb; Muscles of the Lower Limb</td>
<td>12: 188-195 12: 198-209</td>
<td>M: 365-383</td>
<td>#6, 7</td>
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<td>7/10</td>
<td>W</td>
<td>Lab Test Three</td>
<td>14: 242-244 15: 252-261</td>
<td>M: 433-455</td>
<td>#10</td>
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<td></td>
<td>7/17</td>
<td>W</td>
<td>Special Senses: Eye Using Models and Dissection (covered on Test 5)</td>
<td>18: 314-321</td>
<td>M: 549-553</td>
<td>#12</td>
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<tr>
<td></td>
<td>7/22</td>
<td>M</td>
<td>Lab Test Four</td>
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<tr>
<td>9</td>
<td>7/29</td>
<td>M</td>
<td>Endocrine System</td>
<td>19: 344-356</td>
<td>M: 596</td>
<td>#15</td>
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<tr>
<td>10</td>
<td>7/31</td>
<td>W</td>
<td>Lab Test Five – All Students</td>
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</table>

CHILDREN, EATING AND DRINKING ARE NOT ALLOWED IN THE LAB.

M = Marieb and Hoehn’s Human Anatomy and Physiology, 11th ed.

** This schedule is tentative and subject to change at the discretion of the faculty member. All changes will be announced.**
OUTCOMES/OBJECTIVES:
Upon satisfactory completion of BIO 2331 - Anatomy and Physiology I, the student should be able to perform the following outcomes and supporting objectives:

Outcome: A. Compare and contrast anatomy and physiology using the language of anatomy to describe the human body and its organization.
Supporting Objectives:
1. Demonstrate the relationship between anatomy and physiology.
2. List, from simplest to most complex, the major levels of organization in the human body.
3. Use the language of anatomy to describe the human body.
4. Describe the 11 organ systems including their major organs and functions.
5. Identify and describe the major body cavities, membranes, and associated organs.

Outcome: B. Describe homeostatic regulation and apply the concepts of homeostasis to the integration of life functions in the human body.
Supporting Objectives:
6. Define homeostasis and provide examples of it in the human body.
7. Compare and contrast positive and negative feedback in terms of the relationship between the stimulus and response.
8. Define the components of a negative feedback loop in a specific example of homeostasis including the receptor, afferent directional information flow, control center, efferent directional information flow, and effector.
9. Predict the response of the body to factors that disrupt homeostasis.
10. Relate disruptions in the homeostatic regulation to disease states in the human body.

Outcome: C. Demonstrate microscope competency and apply the fundamental knowledge of cell theory and membrane biology to human physiology.
Supporting Objectives:
11. Identify the parts of the compound microscope and describe how to use, handle and store it.
12. Define magnification, resolution, parfocal, field of view, and working distance in relation to microscopy.
13. Describe how to adjust the magnification and resolution of a specimen under the microscope.
14. Calculate the total magnification of a viewed specimen at each objective lens.
15. Describe cell theory.
16. Identify the common parts of a human cell and describe the structure and function of each.
17. Describe the structure of the plasma membrane and explain how this structure relates to its selective permeability.
18. Describe active and passive membrane transport mechanisms.
19. Define tonicity and relate it to osmotic pressure.
20. Predict the net direction of movement of a substance across a cell membrane given its permeability and concentration gradient.

Outcome: D. Describe and differentiate between the four basic tissues that make up the human body and apply this fundamental knowledge to tissue repair and regeneration.
Supporting Objectives:
21. Define tissue and list the four main types of tissue that make up the human body.
22. Compare and contrast the fundamental characteristics of the tissue types.
23. Identify the sub-types of a tissue by describing its function and location in the body.
24. Identify the specialized cells and extracellular structures within each type of tissue and state their significance in terms of the function of the tissue.
25. Describe the structure, function, and body location of mucous, serous, cutaneous and synovial membranes.
26. Distinguish between exocrine and endocrine glands structurally and functionally.
27. Classify a gland as exocrine or endocrine based on its characteristics.
28. Describe how injuries affect tissues and list the stages of tissue repair.
29. Predict the rate of tissue repair based on the knowledge of the tissue type and its regenerative capacity.

Outcome: E. Apply the fundamental knowledge of the integumentary system to explain homeostasis and to predict outcomes of disrupted structure and/or function.
Supporting Objectives:
30. Describe the major functions of the integumentary system.
31. Identify and describe the two components of the cutaneous membrane.
32. Identify and describe the five layers of the epidermis including the specialized cells in each.
33. Describe the process of epidermal growth and keratinization.
34. Explain the biological basis for the color of the epidermis in humans.
35. Identify and describe the two layers of the dermis.
36. Identify the subcutaneous layer describe its composition.
37. Identify and describe the accessory structures of the integumentary system.
38. Describe the growth cycle of hair follicles and the growth of hair.
39. Evaluate the physiological significance of the presence or absence of sebaceous or sweat glands in specific regions of the body.
40. Explain how the integumentary system maintains homeostasis of body temperature.
41. Predict how damage to the skin could disrupt homeostasis in the body.

**Outcome: F. Apply the fundamental knowledge of the skeletal system and articulations to explain homeostasis and to predict outcomes of disrupted structure and/or function.**

Supporting Objectives:
42. Describe the major functions of the skeletal system.
43. Describe the composition of osseous tissue including the specialized cells and organic and inorganic components of the extracellular matrix.
44. Identify the microscopic components of compact and spongy bone.
45. Describe the anatomy and physiology of the cartilage found in the skeletal system and identify the location of each type in the human body.
46. Describe the gross anatomy of bones and classify bones by type.
47. Identify the major structural components of a long bone relative to the function of the bone in the body.
48. Identify the major bone markings and describe their physiological relevance.
49. Compare and contrast the anatomy and physiology of a fetal and adult skull.
50. Compare and contrast the anatomy and physiology of adult male and female skeletons.
51. List the functional and structural classifications of the articulations.
52. Classify each articulation based on composition or degree of movement.
53. Identify the accessory structures of the synovial joint including bursa, tendon sheaths, and ligaments.
54. Identify examples of the six synovial joints in the human body and demonstrate their movements.
55. Define arthritis and explain the causes, symptoms and prognosis of specific types of this disease.
56. Define the terms ossification and calcification and explain the roles of osteogenic cells in the formation of bone.
57. Compare and contrast intramembranous and endochondral ossification.
58. Explain the roles of calcitonin, parathyroid hormone and calcitriol in the homeostatic regulation of blood calcium levels.
59. Predict the impact of homeostatic disturbances to blood calcium levels on bone remodeling and growth.
60. Evaluate factors or situations affecting the skeletal system or articulations that could disrupt homeostasis.

**Outcome: G. Apply the fundamental knowledge of the muscular system to explain homeostasis and to predict outcomes of disrupted structure and/or function.**

Supporting Objectives:
61. Describe the major functions of the muscular system.
62. List the three types of muscle found in the human body, and compare and contrast them in regards to location in the body, structure and function.
63. Describe the organization of skeletal muscle tissue beginning with the skeletal muscle fiber and ending with the whole muscle, including the connective tissue components.
64. Describe the cellular structure of the skeletal muscle fiber including the specialized organelles, transverse tubules, and myofilaments.
65. Explain the anatomy of the myofibril and sarcomere.
66. Identify and describe the function of the contractile, regulatory and structural protein components of the sarcomere.
67. Describe the sliding filament theory of muscle contraction.
68. Identify the components and describe the anatomy of the neuromuscular junction.
69. Define a motor neuron and motor unit.
70. Define membrane potential, action potential, depolarization and repolarization as they relate to the voltage across the sarcolemma.
71. Explain the changes in permeability of the sarcolemma to sodium and potassium during an action potential by describing the opening and closing of voltage-gated ion channels.
72. Interpret a graph illustrating the change in voltage over time in a skeletal muscle fiber during an action potential.
73. Describe how excitation is coupled to contraction of the skeletal muscle fiber.
74. List the sequence of events that occur during the contraction cycle of a skeletal muscle fiber.
75. Evaluate the impact of changes in cellular ion permeability or extracellular ion concentration on muscle contraction.
76. Describe how a muscle obtains energy for muscle contraction and explain factors that lead to muscle fatigue.
77. Summarize the events that must occur for a muscle fiber to relax.
78. Interpret a myogram of a skeletal muscle twitch defining the latent period, contraction and relaxation periods, and describe the physiological events that correspond to each period.
79. Define the term tension as it relates to the contraction of a whole muscle.
80. Explain the physiological phenomenon of wave summation and tetanus as it relates to action potential frequency and whole muscle tension development.
81. Define a contraction as isotonic or isometric.
82. Explain how skeletal muscle names can help identify their action, appearance or location in the body.
83. Define origin, insertion and action as they relate to skeletal muscles.
84. Define the terms agonist (prime mover), antagonist, synergist and fixator as they relate to muscle actions during movement.
85. Identify the major muscles of the human body and state their major actions.

Outcome: H. Apply the fundamental knowledge of the organization and electrophysiology of the nervous system to explain homeostasis and to predict outcomes of disrupted structure and/or function.

Supporting Objectives:
86. Describe the major functions of the nervous system.
87. Describe the role of the nervous system in homeostatic regulation, identifying nervous system elements that are receptors and control centers, and explaining how the nervous system communicates with effectors.
88. Describe the hierarchical organization of the nervous system including the central, peripheral, sensory, motor, somatic, and autonomic nervous systems.
89. List the parts of the nervous system that constitute the central nervous system and those that constitute the peripheral nervous system.
90. Define afferent and efferent as these terms relate to information flow in the nervous system.
91. Describe the two types of cells found in nervous tissue and state their function.
92. Identify and state the function of the parts of a neuron including the dendrite, soma, axon hillock, axon, axon terminal, and synaptic knob or button.
93. Classify neurons based on structure and function.
94. Describe the location of the soma for a motor, sensory, and interneuron within the nervous system.
95. List the six types of glial cells, state their location in the nervous system and describe their function.
96. Compare and contrast myelin formation and structure in the central and peripheral nervous systems and predict the result of its loss in either system.
97. Define membrane potential and explain its significance in nervous system function.
98. Describe how the diffusion of ions across the plasma membrane is regulated by gated ion channels.
99. Define the electrochemical gradient and use it to predict the direction of net movement of an ion through an open channel.
100. Describe the factors that contribute to the resting membrane potential of a neuron.
101. Define excitation, depolarization, repolarization, inhibition and hyperpolarization as they relate to changes in cellular membrane potential.
102. Compare and contrast the graded potential and action potential.
103. Describe the role of ligand-gated and voltage-gated ion channels in neuronal signaling.
104. Describe the general events that occur during neuronal signaling.
105. Describe the changes in ion permeability during an action potential with a focus on the opening and closing of the gated ion channels.
106. Define the physiological threshold for an action potential and identify the anatomical trigger zone on a neuron.
107. Explain why the action potential is known as an “all-or-none” phenomenon.
108. Interpret a graph illustrating the change in voltage over time during an action potential.
109. Identify the absolute and relative refractory periods on the action potential graph and explain their physiological relevance.
110. Predict how the shape of a graphed action potential will change in response to neurotoxins that impact the voltage-gated channels.
111. Define the refractory periods of the action potential and state their physiological relevance.
112. Compare and contrast propagation of an action potential in an axon that is myelinated versus an axon that has no myelin.
113. Explain how axon diameter and myelination affects the speed of conduction of an action potential.
114. Describe the events that occur at the axon terminal that cause the release of neurotransmitters into the synaptic cleft.
115. Define the two types of graded potentials and interpret graphs illustrating each.
116. Describe the basic categories of neurotransmitters and explain how a transmitter may cause excitation or inhibition in the post-synaptic neuron.
117. Describe how a neuromodulator acts differently than the neurotransmitter.
118. Compare and contrast temporal and spatial summation of graded inputs in the post-synaptic neuron.
119. Define synaptic fatigue and synaptic delay.
120. Describe how presynaptic inputs can facilitate or inhibit neuronal signaling.
121. Discuss the meaning of the term neuroplasticity and relate this term in a broad sense to learning and memory.

Outcome: I. Apply the fundamental knowledge of the central nervous system to explain homeostasis and to predict outcomes of disrupted structure and/or function.

Supporting Objectives:
122. Define the components and function of the central nervous system.
123. Describe how the development of the human brain explains its structural features including the major regions and ventricles.
124. Compare and contrast white matter and gray matter in the central nervous system anatomically and functionally.
125. Identify the major regions of the brain and describe the function of each.
126. Predict the physiological consequences of damaging a specific region of the brain based on its function.
127. Describe how the skull, meninges, cerebrospinal fluid and blood brain barrier protect the brain.
128. Trace the path of cerebrospinal fluid circulation from production in the choroid plexus to reabsorption into the circulatory system.
129. Describe the gross anatomy of the spinal cord in a longitudinal view.
130. Label a cross section of a spinal cord in a cervical, thoracic and lumbar region and describe the function of the nuclei and columns visible.
131. Predict the motor and sensory symptoms of a spinal cord injury to a specific region of the spinal cord.

Outcome: J. Apply the fundamental knowledge of the cranial nerves, spinal nerves, and spinal reflexes to explain homeostasis and to predict outcomes of disrupted structure and/or function.

Supporting Objectives:
132. Describe the gross anatomy of a nerve and identify the anatomical features in a cross section.
133. Identify the cranial nerves by name and number and state the function of each.
134. Classify the cranial nerves as sensory, motor or mixed and describe the function of each.
135. Identify the dorsal root ganglia, dorsal and ventral roots, and spinal nerves.
136. Explain how spinal nerves are formed by sensory and motor neuron axons.
137. Trace the path of a motor axon from the spinal cord to the muscle and a sensory neuron axon from the dendrite to the spinal cord including the root, nerve, ramus, and plexus.
138. List the four spinal nerve plexuses, give examples of nerves that emerge from each and describe what structures they innervate.
139. List the five components of a reflex arc.
140. Describe the components, characteristics and purpose of the stretch reflex, tendon reflex, withdrawal reflex, and crossed extensor reflex.
141. Categorize the spinal cord reflexes as innate or acquired, spinal or cranial, somatic or visceral, monosynaptic or polysynaptic, and ipsilateral or contralateral.
142. Define reciprocal inhibition and list the reflexes that utilize it.
143. Explain how a spinal reflex can be facilitated or inhibited by higher regions of the central nervous system.
144. Discuss how specific reflexes are used clinically to assess the function of the nervous system.

Outcome: K. Apply the fundamental knowledge of the general sensory and somatic nervous systems and their associated pathways to and from the central nervous system to explain homeostasis and to predict outcomes of disrupted structure and/or function.

Supporting Objectives:
145. Describe the major functions of the sensory nervous system.
146. Compare and contrast sensation and perception.
147. Define transduction and describe how it occurs in the general and special senses.
148. Compare and contrast general sensation and special sensation.
149. Describe how a stimulus is interpreted according to modality, location, duration and intensity.
150. List the six types of tactile/pressure receptors in the skin, and for each state the anatomy, location, adaptability, and stimuli detected.
151. Define proprioception and describe the types and locations of proprioceptors in the body and what they detect.
152. Describe the thermoreceptors, nociceptors, baroreceptors, and chemoreceptors, explaining their anatomy, location, and stimuli detected.
153. Trace sensory input through the afferent pathways beginning at the sensory receptor and ending at the cerebral or cerebellar cortex.
154. Associate a specific sensory receptor with a specific afferent pathway.
155. Trace motor output through the corticospinal pathway beginning in the primary motor cortex and ending at the skeletal muscle.
156. Describe the indirect motor pathways of the nervous system.
157. Explain the role of the basal nuclei and cerebellum in movement.
158. Predict the sensory and motor symptoms a patient will experience given a specific lesion to the spinal cord based on the tracts damaged.

Outcome: L. Apply the fundamental knowledge of the special senses to explain homeostasis and to predict outcomes of disrupted structure and/or function.
Supporting Objectives:
159. List the five special senses in the human body and describe the location of the specialized sensory organ housing the sensory receptors for each.
160. Trace the pathway of light to the retina and explain how light is focused for distant and close vision.
161. Compare the anatomy and physiology of rods and cones in phototransduction.
162. Describe signal transduction in the retinal cells during light and dark.
163. Trace the pathway of visual input from the retina to the occipital lobe.
164. Describe how the anatomical features of the visual pathway and placement of the eyes allow humans to have depth perception.
165. Describe the part of the inner ear that detects sound waves and equilibrium.
166. Describe the structure and function of a hair cell, and state its location in the inner ear.
167. Trace the pathway of a sound wave from the outer ear to the cochlea.
168. Describe how a sound wave inside the cochlea activates a hair cell.
169. Describe how the amplitude and frequency of a sound wave traveling in the cochlea will determine the volume and pitch of a sound.
170. Trace the pathway of the auditory signal from the hair cells in the cochlea to the auditory cortex in the brain.
171. Compare and contrast sensorineural and conductive deafness.
172. Compare and contrast how the vestibular apparatus detects static and dynamic equilibrium.
173. Describe the pathway for equilibrium from the hair cells to the brain.
174. Discuss the processing of equilibrium in the brain and relate that to motion sickness.
175. Explain how odorants activate olfactory receptors.
176. Describe the path of nerve impulses from the olfactory receptors to the various regions of the brain.
177. Explain how dissolved chemicals activate gustatory receptors.
178. Describe the path of nerve impulses from the gustatory receptors to the various parts of the brain.
179. List the five primary taste sensations and describe how each is transduced at the molecular level by the receptor.
180. Predict how loss of any of the special senses would disrupt homeostasis.

Outcome: M. Apply the fundamental knowledge of the autonomic nervous system to explain homeostasis and to predict outcomes of disrupted structure and/or function.
Supporting Objectives:
181. Define the autonomic nervous system and explain its function.
182. Compare and contrast the autonomic and somatic nervous systems in regards to neurons and neurotransmitters, and effectors.
183. Discuss the two divisions of the autonomic nervous system and state the general physiological role of each.
184. Compare and contrast the anatomy of the sympathetic and parasympathetic divisions, including central nervous system outflow locations, ganglia locations, pre- and post-ganglionic neuron relative lengths, and ganglionic and effector neurotransmitters and receptors.
185. Differentiate between cholinergic and adrenergic nerve fibers and discuss the physiological consequences of acetylcholine and norepinephrine/epinephrine interacting with their receptors at a given effector.
186. Predict the side effects of a pharmacological agent binding to autonomic nervous system target receptors.
187. Define the concepts of dual innervation and autonomic tone in regards to autonomic nervous system function.
188. Discuss the implications in homeostatic regulation of effectors that are not dually innervated by both the sympathetic and parasympathetic systems.
189. Describe a visceral reflex arc and list the higher brain regions that can influence these reflexes.
190. Predict the consequences of disruption of the autonomic nervous system to the body.
Outcome: N. Apply the fundamental knowledge of the endocrine system to explain homeostasis and to predict outcomes of disrupted structure and/or function.

Supporting Objectives:
191. Define the classes of chemical messengers used by the body based on their mode of secretion.
192. Explain the difference between an endocrine and exocrine gland.
193. Compare and contrast the nervous and endocrine systems as the two major control systems in the body.
194. Describe the characteristics of hormones and how they are classified.
195. Describe the common modes of transport, activation patterns, and secretion patterns of hormones.
196. List the three signals that can trigger hormone secretion.
197. Describe how hormone levels in the blood are regulated via positive or negative feedback.
198. Describe the two basic types of hormone receptors and how they generally alter cell function when a hormone is bound.
199. Define second messenger systems and give examples of common ones activated by hormone receptors.
200. List the major structures of the endocrine system.
201. Describe the anatomical and physiological relationship between the hypothalamus and the pituitary gland.
202. For the pituitary, thyroid, parathyroid, adrenal, and pancreas glands, describe the hormone(s) they secrete, the stimulus for secretion, the regulation of the hormone levels in the blood, the target tissue(s), and effect(s) of the hormone.
203. Analyze symptoms and hormone levels to diagnose common endocrine disorders.