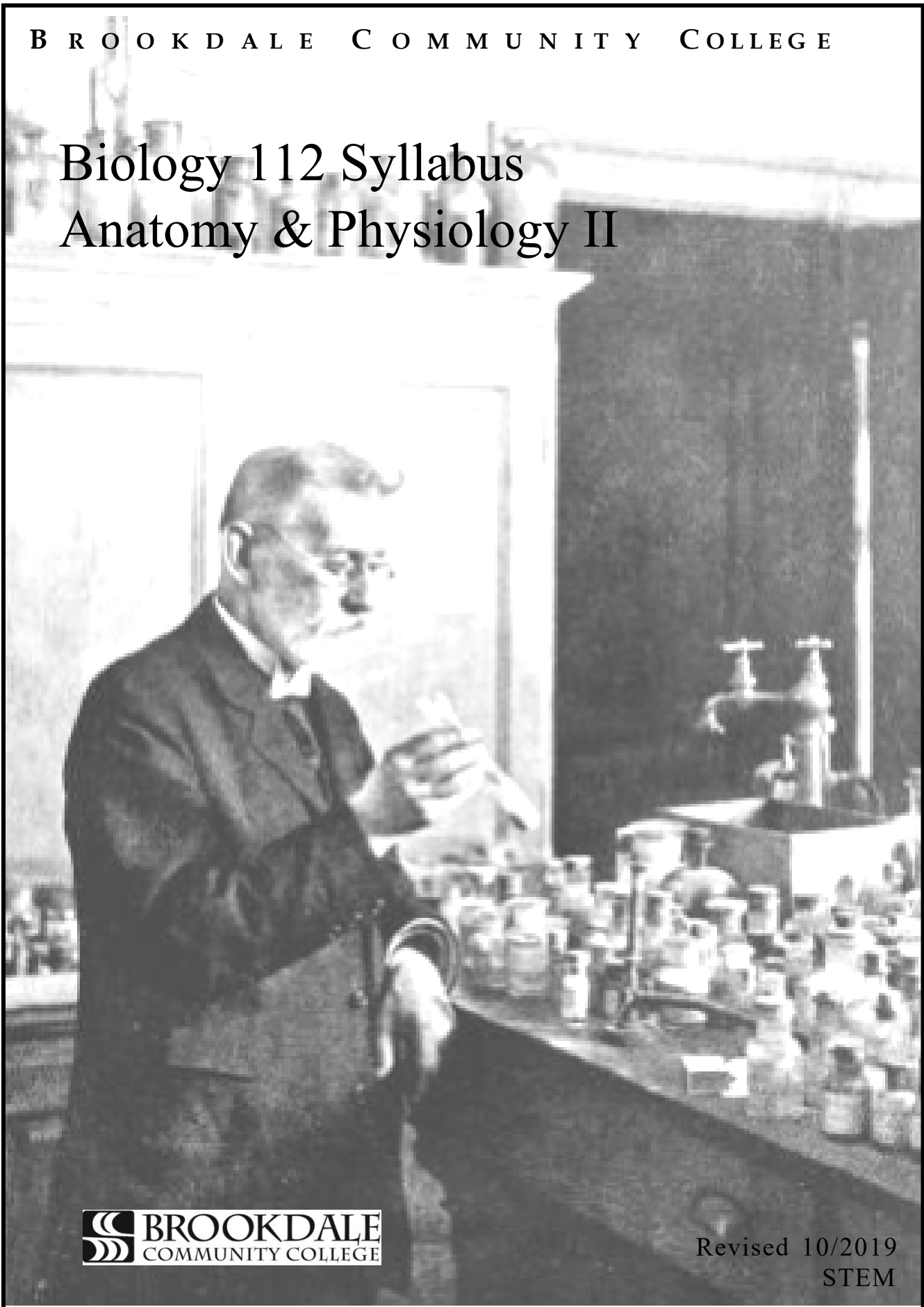


B R O O K D A L E C O M M U N I T Y C O L L E G E

# Biology 112 Syllabus Anatomy & Physiology II



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**CODE:** BIOL 112

**TITLE:** Anatomy and Physiology II

**INSTITUTE:** STEM

**DEPARTMENT:** Biology

**COURSE DESCRIPTION:** As the second course in the Anatomy and Physiology sequence, this course is designed to satisfy the requirements of health sciences programs, the needs of the pre-professional student and those who desire a deeper understanding of the human body. Through classroom and laboratory experiences, the student will be able to identify and describe the anatomy and demonstrate an understanding of the physiology of the human body at the molecular, cellular, tissue and organ system levels. Covered in this course are the cardiovascular, immune, lymphatic, urinary, respiratory, endocrine and reproductive systems of the human body.

**PREREQUISITES:** A grade of “C” or higher in BIOL 111

**COREREQUISITES:**

**PREREQUISITES OR COREREQUISITES:**

**CREDITS:** 4

**LECTURE HOURS:** 3

**LAB/STUDIO HOURS:** 2

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**REQUIRED MATERIALS:**

Textbook: Human Anatomy & Physiology  
Elaine Marieb and Katja Hoehn  
11<sup>th</sup> edition, 2019  
Pearson Education, Inc.

Laboratory Manual: Biology 112 Laboratory Manual

**ADDITIONAL TIME REQUIREMENTS:**

Additional time in the Independent Study Laboratory (Room MAS 056) is required. (See instructor)

**COURSE LEARNING OUTCOMES:**

The student will be able to:

- Examine the gross and microscopic anatomy of the human cardiovascular, urinary, respiratory and reproductive systems and understand the relationships between the various structures.
- Demonstrate comprehension and application of basic concepts regarding the anatomy & physiology of selected organ systems and tissues (hematology, cardiovascular system, immune system, urinary system, respiratory system, endocrine system, and reproductive system).
- Employ the deductive reasoning logic utilized in the scientific method to analyze homeostatic mechanisms and to evaluate homeostatic imbalances involving the above organ systems and tissues.

(SC)

***Learning Outcome(s) support the following General Education Knowledge Areas:***

(SC) Sciences

### **GRADING STANDARD:**

**A student must have an average of 65% or better for the classroom component and an average of 65% or better for the laboratory component of the course in order to earn a passing grade for the course.**

Upon completion of the course, grades will be assigned as follows:

A =	92 – 100%
A- =	89 - 91%
B+ =	86 - 88%
B =	82 - 85%
B- =	79 – 81%
C+ =	76 – 78%
C =	70 – 75%
D =	65 - 69%
F =	<65%

**Unit examination results will be reported as the grade assigned by the faculty calculated to the first decimal place. These grades will be weighed according to course grading policy.**

**In calculating the course grade, 0.5 will round up to the next numerical grade and 0.4 will round down to the next lower numerical grade.**

A grade of C or better is required in all pre-requisite courses. Career studies courses must have a grade of C or better to count toward the Mathematics / Science Program – Biology Option. Students are permitted to withdraw from the course without penalty until approximately 80% of the semester is complete. Please see term schedule for the exact deadline.

At the end of the semester, application for an Incomplete may be made if a student with proper documentation needs to complete no more than one lecture exam and/or one laboratory practical. The granting of an Incomplete is at the discretion of the instructor. Please see Instructor's syllabus for additional Grading Policies.

### **COURSE CONTENT:**

UNIT ONE:	BLOOD
UNIT TWO:	THE IMMUNE SYSTEM
UNIT THREE:	THE CARDIOVASCULAR SYSTEM: THE HEART
UNIT FOUR:	THE CARDIOVASCULAR SYSTEM: BLOOD VESSELS
UNIT FIVE:	THE LYMPHATIC SYSTEM
UNIT SIX:	BODY FLUIDS AND CAPILLARY DYNAMICS
UNIT SEVEN:	THE URINARY SYSTEM
UNIT EIGHT:	THE RESPIRATORY SYSTEM
UNIT NINE:	THE ENDOCRINE SYSTEM
UNIT TEN:	REPRODUCTION AND DEVELOPMENT

### **DEPARTMENT POLICIES:**

**Attendance** during class and laboratory sessions is strongly recommended for optimum performance in biology courses.

**Laboratory practicals** will be given during laboratory sessions, in accordance with schedules provided by the learning assistants. Exams and practicals must be taken at the times designated by the instructor or learning assistant. A student who misses a lecture exam or laboratory practical must provide prior notification and proper documentation in order to take the exam or laboratory practical. The acceptance of said prior notification and proper documentation will be determined by the instructor.

**Documentation** must be provided within one week of the student's return to the classroom for a make-up exam or laboratory practical to be scheduled. A student who is unable to provide proper documentation for a missed exam or laboratory practical will be given a grade of zero for that exercise. Students may not re-take exams or laboratory practicals on which they perform poorly. Requirements for the completion of laboratory are listed in the laboratory responsibility sheets for individual courses. Requirements for course completion are listed in individual instructor syllabi.

### **COLLEGE POLICIES:**

As an academic institution, Brookdale facilitates the free exchange of ideas, upholds the virtues of civil discourse, and honors diverse perspectives informed by credible sources. Our College values all students and strives for inclusion and safety regardless of a student's disability, age, sex, gender identity, sexual orientation, race, ethnicity, country of origin, immigration status, religious affiliation, political orientation, socioeconomic standing, and veteran status. For additional information, support services, and engagement opportunities, please visit [www.brookdalecc.edu/support/](http://www.brookdalecc.edu/support/)

For information regarding:

- ◆ Brookdale's Academic Integrity Code
- ◆ Student Conduct Code
- ◆ Student Grade Appeal Process

Please refer to the **STUDENT HANDBOOK AND BCC CATALOG.**

### **NOTIFICATION FOR STUDENTS WITH DISABILITIES:**

Brookdale Community College offers reasonable accommodations and/or services to persons with disabilities. Students with disabilities who wish to self-identify, must contact the Disabilities Services Office at 732-224-2730 or 732-842-4211 (TTY), provide appropriate documentation of the disability, and request specific accommodations or services. If a student qualifies, reasonable accommodations and/or services, which are appropriate for the college level and are recommended in the documentation, can be approved.

### **ADDITIONAL SUPPORT/LABS:**

BIOL 112 course and laboratory resources are available in CANVAS, Brookdale's Learning Management System, which is available via Brookdale's website: [www.brookdalecc.edu](http://www.brookdalecc.edu)

Independent Study Laboratory ("Open Lab") – MAS 056 – is available to students enrolled in this biology course. Students use this lab to complete laboratory exercises, review lab materials, and to get help with course material from laboratory instructors that staff the lab.

Biology Department course and program information available on the Biology Department website:

<https://www.brookdalecc.edu/stem-institute/biology/>

### **MENTAL HEALTH:**

- Mental Health Crisis Support: From a campus phone, dial 5555 or 732-224-2329 from an external line; off-hours calls will be forwarded to BCC police (2222 from a campus phone)
- Psychological Counseling Services: 732-224-2986 (to schedule an appointment during regular hours)

**BIOL 112**  
Course #

**Anatomy & Physiology II**  
Title

**#1 of 10 units**

**4.0**  
credits

**Name of Unit:** Chapter 17: Blood

**Unit Objectives:** To discuss the makeup and function of the blood as a living tissue. The student will be presented with the cellular and non-cellular components and will describe the function and origin of each.

**Method of Evaluation:** Quizzes, Unit Examination, Laboratory Performance

<b>Learning Objectives</b>	<b>Recommended Learning Experiences</b>
The student will be able to:	1. Class Discussion 2. Textbook Readings
1. Describe the functions of blood: <ul style="list-style-type: none"><li>• transport</li><li>• regulation</li><li>• protection</li></ul>	pages 643
2. Describe the main components of blood: <ul style="list-style-type: none"><li>• Plasma</li><li>• Formed elements<ul style="list-style-type: none"><li>○ RBCs</li><li>○ WBCs</li><li>○ Platelets</li></ul></li></ul>	pages 643-644 figure 17.1
3. Define hematocrit and list normal values for males and females. Discuss the implications of low and high hematocrits.	page 644
4. List the physical characteristics of blood: <ul style="list-style-type: none"><li>• pH</li><li>• color</li><li>• temperature</li><li>• mixture characteristics (suspension and solution)</li><li>• volume</li></ul>	page 644
5. List and describe the physical characteristics and components of plasma: <ul style="list-style-type: none"><li>• water</li><li>• proteins (albumin, <math>\alpha</math>, <math>\beta</math> globulins &amp; <math>\gamma</math> globulins, clotting proteins, complement, and enzymes)</li><li>• other (electrolytes, nitrogenous wastes, nutrients, and blood gases)</li></ul>	page 644 table 17.1
6. Describe erythrocytes (RBCs). Include number, size shape, color, hemoglobin and function in the discussion.	pages 645-647 figure 17.3 table 17.2
7. Describe the structure of hemoglobin. Define oxyhemoglobin, deoxyhemoglobin and carbaminohemoglobin.	page 646 figure 17.4

Learning Objectives	Recommended Learning Experiences
8. Describe hematopoiesis. Include red bone marrow, reticular connective tissue, hematopoietic, myeloid and lymphoid stem cells in the discussion.	page 646
9. Outline the major stages of erythropoiesis (RBC production). Include the proerythroblast, early and late erythroblast, reticulocyte, and erythrocyte stages.	page 647 figure 17.5
10. Discuss the homeostatic and hormonal controls leading to erythropoiesis. Describe the role and source of erythropoietin, and the role of the B complex vitamins and iron.	pages 648-649 figure 17.6
11. Describe the life cycle of RBCs. Include: <ul style="list-style-type: none"> <li>• removal of RBCs from the blood stream (after about 120 days) by splenic or liver macrophage cells.</li> <li>• hemoglobin recycling by enzymatic breakdown (ultimately into the bile pigment bilirubin) and reuse of iron. Define and discuss the role of transferrin, ferritin, and hemosiderin.</li> </ul>	page 649 figure 17.7
12. Discuss erythrocyte disorders: <ul style="list-style-type: none"> <li>• hemorrhagic anemia</li> <li>• hemolytic anemia</li> <li>• aplastic anemia</li> <li>• iron-deficiency anemia</li> <li>• pernicious anemia</li> <li>• thalassemia</li> <li>• sickle-cell anemia</li> <li>• polycythemia</li> </ul>	pages 650-651 figure 17.8
13. Discuss the general structural and functional characteristics of WBCs (leukocytes). Include types, size, shape, numbers, and special features (diapedesis, amoeboid movement, and positive chemotaxis).	pages 651-652 figure 17.9 table 17.2
14. Compare the two major types of WBCs found in the general circulation: granulocytes and agranulocytes.	pages 652-653
15. Describe the characteristics of the granulocytes: <ul style="list-style-type: none"> <li>• neutrophils</li> <li>• eosinophils</li> <li>• basophils</li> </ul> Include numbers, sizes, functions and diagnostic procedures in the discussion.	pages 652-653 figure 17.10 table 17.2

Learning Objectives	Recommended Learning Experiences
<p>16. Describe the characteristics of the agranulocytes:</p> <ul style="list-style-type: none"> <li>• lymphocytes</li> <li>• monocytes</li> </ul> <p>Include numbers, sizes, and functions in the discussion.</p>	<p>page 653 figure 17.10 table 17.2</p>
<p>17. List the major steps of leukopoiesis (WBC production). Include the two stem cell lines (myeloid/lymphoid) and the role of hormonal regulation. The immunologic role of the lymphocytes will be covered in more detail in Chapter 21.</p>	<p>pages 653-654 figure 17.11</p>
<p>18. Discuss some of the basic WBC disorders including leukemia and mononucleosis.</p>	<p>page 654</p>
<p>19. Describe the characteristics of platelets (thrombocytes) in terms of numbers, size, thrombopoiesis (platelet production) and functions.</p>	<p>page 657 figure 17.12 table 17.2</p>
<p>20. Describe the steps which stop bleeding (hemostasis):</p> <ul style="list-style-type: none"> <li>• vascular spasm</li> <li>• platelet plug formation</li> <li>• coagulation</li> </ul> <p>Include in the discussion:</p> <ul style="list-style-type: none"> <li>• the major coagulating factors</li> <li>• the intrinsic and extrinsic pathways</li> <li>• the common pathway</li> <li>• anticoagulants</li> <li>• clot retraction and removal</li> <li>• hemostatic disorders</li> </ul>	<p>pages 657-663 figures 17.13-17.15 table 17.3</p>
<p>21. Discuss the ABO and Rh blood groups and blood types. Describe the consequences of incompatibility in blood transfusions by using the terms anti-A and anti-B antibodies, antigen, universal blood donor and universal blood recipient.</p> <p>Describe the importance of the Rh factor in pregnancy.</p>	<p>pages 663-666 figure 17.16 table 17.4</p>

**Name of Unit:** Chapter 21: The Immune system

**Unit Objectives:** To describe the immune functions of the body – both innate and adaptive defenses

**Method of Evaluation:** Quizzes, Unit Examination

<b>Learning Objectives</b>	<b>Recommended Learning Experiences</b>
The student will be able to:	1. Class Discussion 2. Textbook Readings
1. Identify the two basic ways the immune system defends against invasion from the outside world: nonspecific and specific immunity.	page 782 figure 21.1
2. Describe the components of nonspecific (innate) immunity. Include first line of defense (skin and mucous membranes) and second line of defense (cells and chemicals).	pages 782-789 figure 21.2 tables 21.2-21.3
3. Describe the inflammatory response and phagocyte mobilization.	pages 785-787 figures 21.3-21.4
4. Discuss the functions of protective chemicals released by the immune system: interferons, complement, and pyrogens.	pages 788-789 figures 21.5-21.6
5. List and describe the major characteristics of the specific (adaptive) immune system. Include the terms systemic, specific, and memory in the discussion. Distinguish between antibody-mediated (humoral) and cell-mediated immunity.	pages 790-791
6. Define antigen and describe how antigens affect the adaptive immune system	pages 791-792 figure 21.7
7. Briefly describe the development, maturation, and activation of lymphocytes.	pages 792-794 figure 21.8
8. Describe the humoral immune response (antibody-mediated immunity). Include a discussion of memory and the primary and secondary immune responses.	pages 796-797 figures 21.11-21.12
9. Identify the four types of acquired humoral immunity by specifying whether active or passive and naturally or artificially acquired.	pages 797-798 figure 21.13



Learning Objectives	Recommended Learning Experiences
10. Describe antibody structure and list the five major antibody classes to include molecular characteristics, sources and actions.	pages 798-799 figure 21.14 table 21.5
11. Describe the mechanisms of antibody action: <ul style="list-style-type: none"> <li>• neutralization</li> <li>• agglutination</li> <li>• precipitation</li> <li>• complement activation</li> </ul>	pages 800-801 figure 21.15
12. Explain antigen processing and the roles of antigen presenting cells, macrophages, MHCs and cytokines in T-cell activation (cell-mediated immunity).	pages 801-805 figure 21.16 tables 21.6-21.7
13. Describe the specific roles of Cytotoxic T-Cells and Helper T-Cells.	pages 805-807 figures 21.18-21.19 tables 21.4, 21.8
14. Discuss the role of tissue or transplant rejection by cell-specific responses. Define the following: <ul style="list-style-type: none"> <li>• autograft</li> <li>• isograft</li> <li>• allograft</li> <li>• xenograft</li> </ul>	pages 810-811
15. Discuss immunodeficiencies (including AIDS), autoimmune diseases and hypersensitivities.	pages 811-814 figure 21.20

Name of Unit:                   **Chapter 18: The Cardiovascular System: The Heart**

Unit Objectives:               To discuss the major structural and functional characteristics of the heart, with special emphasis on its cytology, histology, and physiology.

Method of Evaluation:       Quizzes, Unit Examination, Laboratory Performance

<b>Learning Objectives</b>	<b>Recommended Learning Experiences</b>
The student will be able to:	1. Class Discussion 2. Textbook Readings 3. Laboratory Experiences:
1. Describe the location and orientation of the heart by using bony landmarks. Describe the size and weight of the heart.	page 672 figure 18.2
2. Describe the coverings of the heart by defining the following terms: pericardium fibrous layer, serous layers (parietal and visceral serosa or epicardium), and the pericardial cavity.	page 673 figure 18.3
3. Describe the layers of the heart wall: <ul style="list-style-type: none"><li>• epicardium</li><li>• myocardium</li><li>• endocardium</li></ul>	pages 673-674 figure 18.3
4. Relate the basic anatomy and landmarks of the heart chambers to the great blood vessels associated with the heart. Include: <ul style="list-style-type: none"><li>• atria</li><li>• ventricles</li><li>• interventricular septum</li><li>• interatrial septum</li><li>• interventricular and coronary sulci</li></ul>	page 674 figure 18.5
5. Discuss the role and structure of the atria by defining the following: auricles, pectinate muscles, fossa ovalis (remnant of foramen ovale). The right atrium receives 3 veins: superior and inferior vena cavae, and the coronary sinus. The left atrium receives the four pulmonary veins.	page 674 figure 18.5

Learning Objectives	Recommended Learning Experiences
<p>6. Evaluate the role and structure of the ventricles defining the following:</p> <ul style="list-style-type: none"> <li>• trabeculae carneae</li> <li>• papillary muscles</li> <li>• chordae tendineae</li> <li>• pulmonary trunk</li> <li>• ascending aorta</li> </ul>	<p>page 674 figure 18.5</p>
<p>7. Trace the flow of blood through the heart by following the pulmonary and systemic circuits. Describe the role of these valves in blood flow:</p> <ul style="list-style-type: none"> <li>• two atrioventricular valves (tricuspid and bicuspid)</li> <li>• two semilunar valves (pulmonary and aortic).</li> </ul>	<p>pages 671, 679-682 figures 18.1, 18.6-18.8</p>
<p>8. Trace the blood supply to the heart (coronary circulation) by following the flow of blood through these vessels: right and left coronary arteries, anterior interventricular artery, circumflex artery, posterior interventricular artery, marginal artery, and collateral routes.</p>	<p>pages 682-683 figure 18.10</p>
<p>9. Analyze the microscopic anatomy of cardiac muscle by defining the following:</p> <ul style="list-style-type: none"> <li>• functional syncytium</li> <li>• intercalated discs</li> <li>• Ca<sup>+2</sup> channels</li> <li>• contractile muscle cells</li> <li>• pacemaker cells</li> </ul>	<p>pages 684-686 figure 18.11</p>
<p>10. Describe how action potentials are initiated by autorhythmic pacemaker cells. Discuss the unstable resting potential of the pacemaker cells and describe how the pacemaker potential leads to depolarization.</p>	<p>page 686 figure 18.12</p>

Learning Objectives	Recommended Learning Experiences
11. Trace the sequence of excitation through the intrinsic cardiac conduction system: <ul style="list-style-type: none"> <li>• SA node</li> <li>• AV node</li> <li>• Bundle of His</li> <li>• right and left bundle branches</li> <li>• Purkinje fibers</li> </ul>	pages 686-688 figure 18.13
12. Briefly discuss arrhythmias caused by ectopic pacemakers and heart blocks.	pages 688-689
13. Describe how the autonomic nervous system modifies the basic rhythm of the heart.	page 689 figure 18.14
14. Describe the action potentials of contractile cardiac muscle cells: <ul style="list-style-type: none"> <li>• depolarization</li> <li>• plateau</li> <li>• repolarization</li> </ul>	page 689 figure 18.15
15. Describe electrocardiography (EKG or ECG; the study of electrical activity within the heart).	pages 690-691
16. Describe the major EKG deflection waves which represent depolarization and repolarization events. Indicate the significance of the <ul style="list-style-type: none"> <li>• P wave (atrial depolarization)</li> <li>• QRS complex (ventricular depolarization),</li> <li>• T wave (ventricular repolarization)</li> <li>• P-Q interval</li> <li>• S-T segment</li> <li>• Q-T interval</li> </ul>	page 691 figures 18.16-18.17
17. Describe the various heart sounds (valve closings); discuss their significance and valve function abnormalities (murmurs and stenosis).	pages 693-696
18. Define systole and diastole. Correlate the EKG waves with atrial systole, ventricular systole and ventricular diastole.	pages 692-693

Learning Objectives	Recommended Learning Experiences
<p>19. Describe the events occurring during each period of the cardiac cycle:</p> <ul style="list-style-type: none"> <li>• Atrial systole</li> <li>• Ventricular systole</li> <li>• Relaxation period</li> </ul> <p>Define: isovolumetric contraction phase, ventricular ejection phase, aortic notch, isovolumetric relaxation phase, end-diastolic volume (EDV), end-systolic volume (ESV), and stroke volume.</p>	<p>pages 692-696 Focus figure 18.2</p>
<p>20. Calculate the cardiac output. Explain the significance of the cardiac reserve.</p>	<p>pages 696-697</p>
<p>21. Describe factors that regulate stroke volume:</p> <ul style="list-style-type: none"> <li>• preload (Frank-Starling Law of the heart, stretch)</li> <li>• contractility (independent of stretch)</li> <li>• afterload (back pressure of arterial blood)</li> </ul>	<p>pages 697-698 figure 18.20</p>
<p>22. Describe factors that regulate the heart rate:</p> <ul style="list-style-type: none"> <li>• sympathetic and parasympathetic effects</li> <li>• hormones</li> <li>• ions</li> </ul>	<p>pages 698-699</p>

**Name of Unit:** Chapter 19: The Cardiovascular System: Blood Vessels

**Unit Objective:** To discuss the anatomy of blood vessels and explore the factors that influence blood pressure

**Method of Evaluation:** Quizzes, Unit Examination, Laboratory Performance

<b>Learning Objectives</b>	<b>Recommended Learning Experiences</b>
The student will be able to:	1. Class Discussion 2. Textbook Readings 3. Laboratory Experiences:
1. Describe the 3 major types of blood vessels found within the body: arteries, capillaries, and veins. This description should state that arteries take blood away from the heart, capillaries are where over 98% of exchanges between cells and blood occur, and veins return blood back to the heart.	page 707
2. Discuss the general structure of blood vessels by describing their major layers: <ul style="list-style-type: none"> <li>• tunica intima (interna)</li> <li>• tunica media</li> <li>• tunica externa (adventitia)</li> </ul>	page 709 figure 19.2
3. Describe the tunica intima, the innermost layer of the blood vessel wall. Define the “endothelium” (simple squamous epithelial cells), and note that this layer is in direct contact with the blood.	page 709 figure 19.2
4. Describe the tunica media (middle layer) and note the structural differences between arteries and veins. Discuss the role of the tunica media in vasoconstriction and vasodilation.	page 709 figure 19.2
5. Describe the tunica externa, the outermost layer. Note the differences between arteries and veins. Discuss the composition of this layer, including collagen fibers, nerve fibers, and lymphatic vessels. Note that larger vessels contain small blood vessels – called the vasa vasorum – needed to feed the muscle layer.	page 709 figure 19.2
6. List and describe the major types of arteries found within the cardiovascular system: <ul style="list-style-type: none"> <li>• elastic arteries</li> <li>• muscular arteries</li> <li>• arterioles</li> </ul>	page 710 figure 19.1 table 19.1

Learning Objectives	Recommended Learning Experiences
7. List and describe the major types of capillaries and give examples of where they are located: <ul style="list-style-type: none"><li>• continuous capillaries</li><li>• fenestrated capillaries</li><li>• sinusoids</li></ul> Define the terms capillary bed, terminal arterioles, metarterioles, true capillaries, and precapillary sphincters.	pages 710-712 figures 19.3-19.5 table 19.1
8. List and describe the major characteristics of veins and venules. Define capacitance vessels (blood reservoirs), venous valves and venous sinuses.	pages 712-714 figures 19.2, 19.6 table 19.1
9. Define the following: arterial anastomoses, collateral channels, arteriovenous anastomoses, and venous anastomoses.	page 714
10. Describe the dynamics of circulation physiology by defining the following: <ul style="list-style-type: none"><li>• blood flow</li><li>• blood pressure</li><li>• peripheral resistance</li><li>• blood viscosity</li><li>• total blood vessel length</li><li>• blood vessel diameter</li></ul>	pages 714-715
11. Discuss the relationship of blood flow (F), difference in blood pressure ( $\Delta P$ ) and peripheral resistance (R) by the formula: $F = \frac{\Delta P}{R}$	page 715
12. Discuss the components of systemic blood pressure by defining the relationship between pumping action of the heart, blood flow, and vascular resistance.	page 716
13. Assess the major causes of arterial blood pressure: compliance (distensibility) and blood volume. Evaluate factors such as diastolic and systolic pressures, pulse pressure, and mean arterial pressure.	page 716 figure 19.7

<b>Learning Objectives</b>	<b>Recommended Learning Experiences</b>
14. Discuss why capillary beds need to operate at low pressures (between 20-40 mm Hg).	page 717
15. Discuss venous blood pressure and the factors affecting venous blood return: <ul style="list-style-type: none"><li>• respiratory pump</li><li>• muscular pump</li><li>• sympathetic venoconstriction</li></ul>	pages 717-718 figure 19.9
16. Understand the basics of maintaining blood pressure by comparing the main factors that influence pressure: <ul style="list-style-type: none"><li>• cardiac output</li><li>• peripheral resistance</li><li>• blood volume</li></ul>	pages 718-719 figure 19.10
17. Understand the basics of short-term neural regulation of blood pressure by comparing the main factors that influence pressure: <ul style="list-style-type: none"><li>• vasomotor tone</li><li>• baroreceptor reflexes</li><li>• chemoreceptor reflexes (carotid sinuses, bodies, aortic arch)</li><li>• higher brain center influences</li></ul>	pages 719-721 figure 19.11
18. Assess the effects of these hormones on blood pressure: <ul style="list-style-type: none"><li>• epinephrine and norepinephrine</li><li>• angiotensin II</li><li>• atrial natriuretic peptide (ANP)</li><li>• antidiuretic hormone (ADH)</li></ul>	page 721 table 19.2
19. Describe long-term mechanisms for regulating blood pressure: renal regulation (renin-angiotensin), and aldosterone effect.	pages 721-723 figure 19.12
20. Describe homeostatic imbalances in blood pressure: <ul style="list-style-type: none"><li>• orthostatic hypotension</li><li>• chronic vs. acute hypotension</li><li>• chronic vs. acute, primary or essential hypertension factors (diet, obesity, age, race, heredity, stress, and smoking).</li></ul>	pages 724-725
21. Describe factors leading to circulatory shock: <ul style="list-style-type: none"><li>• hypovolemic shock</li><li>• vascular shock</li><li>• cardiogenic shock</li></ul>	pages 724-725



**BIOL 112**  
Course #

**Anatomy & Physiology II**  
Title

**#4 of 10 units**

**4.0**  
credits

Learning Objectives	Recommended Learning Experiences
22. Analyze factors affecting the autoregulation of blood flow: intrinsic control at the organ level, metabolic controls, and myogenic controls.	pages 725-727 figure 19.16
23. Discuss blood flow in special areas of the body: skeletal muscles, brain, the skin, the lungs, the heart, and capillaries.	pages 727-729 figure 19.17
24. Describe what is meant by velocity of blood flow. Describe how and why blood velocity changes through the vasculature.	page 730 figure 19.18
25. Discuss the pressures that cause movement of fluids between capillaries and interstitial spaces. Define diffusion, bulk flow, filtration and reabsorption in the discussion.	page 730-731 figure 19.19
26. Correctly locate the blood vessels of the body as listed in the Laboratory Manual.	

**BIOL 112**  
Course #

**Anatomy & Physiology II**  
Title

**#5 of 10 units**

**4.0**  
credits

**Name of Unit:** Chapter 20: The Lymphatic System

**Unit Objectives:** To discuss the structure, distribution and function of lymphatic vessels, lymphatic organs, lymphoid tissue, and lymph.

**Method of Evaluation:** Quizzes, Unit Examination

<b>Learning Objectives</b>	<b>Recommended Learning Experiences</b>
The student will be able to:	1. Class Discussion 2. Textbook Readings:
1. List the functions of the lymphatic system. Describe the structure and distribution of lymphatic vessels.	page 767
2. Define lymphatic capillaries. Describe the directed flow of lymphatic fluid by the one-way, flap-like valves of lymphatic capillaries.	pages 767-769 figure 20.1
3. Define the following: <ul style="list-style-type: none"><li>• lacteals</li><li>• collecting lymphatic vessels</li><li>• lymphatic trunks</li><li>• right lymphatic duct</li><li>• thoracic duct</li><li>• cisternae chyli</li></ul>	page 769 figures 20.2-20.3
4. Describe lymph transport.	pages 769-770
5. List and explain the functions of the major lymphoid cells: <ul style="list-style-type: none"><li>• B lymphocytes</li><li>• T lymphocytes</li><li>• plasma cells</li><li>• macrophages</li><li>• dendritic cells</li><li>• reticular cells</li></ul>	page 770
6. Describe the composition of lymphoid tissue by defining the following: <ul style="list-style-type: none"><li>• reticular connective tissue</li><li>• diffuse lymphoid tissue</li><li>• lymphoid follicles (nodules)</li></ul>	pages 770-771 figure 20.4

Learning Objectives	Recommended Learning Experiences
7. Describe the function and structure of lymph nodes to include capsule, trabeculae, cortex, medulla, medullary cords and lymph sinuses.	pages 771-772 figure 20.6
8. Discuss circulation in lymph nodes to include afferent and efferent lymphatic vessels.	pages 772-773 figure 20.6
9. List, locate, and discuss the functions of other lymphoid organs and tissues of the body: <ul style="list-style-type: none"><li>• Spleen</li><li>• Thymus</li><li>• Mucosa-associated lymphoid tissue (MALT):<ul style="list-style-type: none"><li>○ tonsils</li><li>○ Peyer's patches</li><li>○ appendix</li></ul></li></ul>	pages 771, 773-776 figures 20.5, 20.7-20.10 table 20.1

**BIOL 112**

Course #

**Anatomy & Physiology II**

Title

**#6 of 10 units**

**4.0**  
credits

**Name of Unit:** Chapters 19 and 26: Body Fluids and Capillary Dynamics

**Unit Objectives:** To describe the major body fluids and explain the exchanges that occur at the level of the capillary

**Method of Evaluation:** Quizzes, Unit Examination

Learning Objectives	Recommended Learning Experiences
The student will be able to:	1. Class Discussion
	2. Textbook Readings:
1. Identify the major body fluid compartments and list characteristics of each.	page 1013 figure 26.1
2. Describe electrolytes, nonelectrolytes and how each can contribute to osmolarity. Identify the major cations and anions of the body fluid compartments.	pages 1013-1015 figure 26.2
3. Explain the major sources of body water and routes of water loss from the body.	page 1016 figure 26.4
4. Describe the regulation of water intake or water output through: <ul style="list-style-type: none"> <li>• the thirst mechanism</li> <li>• ADH</li> </ul>	pages 1016-1018 figures 26.5-26.6
5. Describe the structure of a systemic capillary wall and how the three epithelial cell surfaces may affect the passage of materials between the plasma and the interstitial fluid.	page 730-734 figure 19.19
6. Explain how the hydrostatic and osmotic pressures of the plasma and interstitial fluid affect movement through capillary walls. Using specific values for hydrostatic and osmotic pressure, demonstrate circulation through the tissue space.	pages 731-734 Focus figure 19.1
7. Demonstrate equilibrium when given the average hydrostatic pressure across the length of a capillary bed. Describe edema and dehydration of the tissues in instances of disequilibrium.	pages 734, 1018-1019 figure 26.7

**BIOL 112**

Course #

**Anatomy & Physiology II**

Title

**#7 of 10 units****4.0**

credits

**Name of Unit: Chapter 25: The Urinary System****Unit Objective:** To understand the regulation of body fluid osmolarity, cleansing of the blood and acid-base balance as roles of the urinary system**Method of Evaluation:** Quizzes, Unit Examination, Laboratory Performance

<b>Learning Objectives</b>	<b>Recommended Learning Experiences</b>
The student will be able to:	1. Class Discussion 2. Textbook Readings 3. Laboratory Experiences:
1. Describe in detail the macroscopic and microscopic anatomy of the urinary system.	pages 975-983 Laboratory Experiences
2. Relate the specifics of glomerular microstructure to filtration.	pages 982-986 figures 25.10, 25.12
3. Using examples of the hydrostatic and osmotic pressures involved, calculate the net filtration pressure (NFP).	page 986 figure 25.13
4. Define and give sample values for glomerular filtration rate (GFR); describe the relationship between NFP and GFR.	pages 986-987
5. Describe the mechanisms that regulate GFR.	pages 987-989 figure 25.14
6. Describe and relate to the microstructure of tubular cells the passive and active transport mechanisms that govern reabsorption.	pages 989-990 figure 25.15
7. List the substances reabsorbed at each part of the renal and collecting tubules, and state whether active or passive transport is used in each case.	pages 990-994 table 25.2
8. List substances that are secreted and the tubule involved.	pages 994-995
9. Define osmoregulation and its importance to homeostasis.	pages 993-994, 1017-1018

Learning Objectives	Recommended Learning Experiences
10. Describe the countercurrent mechanism and its role in osmoregulation.	pages 995-1000 figure 25.18 Focus figure 25.1
11. Understand the role of antidiuretic hormone (ADH) in osmoregulation. Describe the source, chemical nature, target and action of ADH.	pages 998-1000
12. Define renal clearance and give examples of clearance rates for glucose, inulin, urea and sample electrolytes.	pages 1000-1001
13. List the characteristics and composition of urine; identify examples of abnormal urinary constituents and possible causes for their appearance in the urine.	pages 1001-1002 table 25.3
14. Describe the macroscopic and microscopic anatomy of the ureters, urinary bladder and urethra.	pages 1002-1004 figure 25.21
15. Describe the micturition reflex including the roles of stretch receptors, the detrusor muscle and urethral sphincters.	pages 1004-1005
16. List causes and consequences of electrolyte imbalances.	page 1019 table 26.1
17. Define a buffer and describe the three major buffer systems of body fluids.	pages 1026-1028 figure 26.12
18. Describe renal mechanisms of acid-base balance in terms of hydrogen ion excretion, ammonium excretion and bicarbonate excretion.	pages 1029-1032 figures 26.13-26.15

**BIOL 112**

Course #

**Anatomy & Physiology II**

Title

**#8 of 10 units**

**4.0**

credits

**Name of Unit:** Chapter 22: The Respiratory System

**Unit Objectives:** To understand ventilation, respiratory gas exchange and transport, oxygen utilization by cells and controls of respiration.

**Method of Evaluation:** Quizzes, Unit Examination , Laboratory Performance

<b>Learning Objectives</b>	<b>Recommended Learning Experiences</b>
The student will be able to:	1. Class Discussion 2. Textbook Readings 3. Laboratory Experiences
1. Describe the four processes of respiration: <ul style="list-style-type: none"><li>• Pulmonary ventilation</li><li>• External respiration</li><li>• Transport of respiratory gases</li><li>• Internal respiration</li></ul>	page 819 figure 22.1
2. Identify the macroscopic and microscopic anatomy of the respiratory system beginning at the nasal passages and continuing to the alveoli.	pages 820-831 figures 22.2-22.12 Laboratory Experiences
3. Distinguish between conducting and respiratory zone structures of the respiratory system.	pages 828-831 figures 22.9-22.11
4. Describe the mechanisms to humidify, cleanse and warm the inspired air.	pages 820-822
5. Define Boyle's law and relate it to inspiration and expiration.	page 836
6. Define atmospheric pressure, alveolar (intrapulmonary) pressure and intrapleural pressure; list the pressures at rest and changes that occur during inspiration and expiration.	pages 834-838 figure 22.14
7. Identify the muscles of inspiration and expiration and how these muscles change the dimensions of the thoracic cage to produce the pressure differences necessary for ventilation.	pages 836-838 figure 22.16
8. Describe airway resistance, alveolar surface tension, and lung compliance in terms of how they affect ventilation; explain the role of surfactant in ventilation.	pages 838-840
9. Identify and explain the volumes and capacities on the spiogram.	pages 840-841 figure 22.19

Learning Objectives	Recommended Learning Experiences
10. Define anatomical dead space, minute ventilation and alveolar ventilation rate; compare each during different breathing patterns.	pages 841-842 table 22.3
11. Define a respiratory membrane, and describe its structure including the major types of alveolar cells.	pages 829-831 figure 22.11
12. Define Dalton's Law and Henry's Law relating each to principles of gas exchange.	page 843
13. Compare the gas partial pressures in atmospheric and alveolar air; list the partial pressures of the respiratory gases in arterial and venous blood.	pages 843-844 figure 22.20 table 22.4
14. Describe external and internal respiration, the exchange (diffusion) of respiratory gases in the lungs and in the tissues.	pages 844-847 figure 22.20
15. Explain why hemoglobin is necessary to transport oxygen and its oxygen carrying capacity.	page 847
16. Describe the oxygen-hemoglobin dissociation curve in terms of loading and unloading of oxygen; describe the effects of pH and temperature on the loading and unloading of oxygen.	pages 847-850 figure 22.24 Focus figure 22.1
17. Describe the Bohr effect on oxygen unloading.	page 850
18. Describe the three ways in which carbon dioxide is transported by the blood.	pages 850-852
19. Describe the Haldane effect upon formation of carbaminohemoglobin.	page 852
20. Identify and describe the medullary and pontine respiratory centers.	pages 853-854 figures 22.26



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**Anatomy & Physiology II**  
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**4.0**  
credits

Learning Objectives	Recommended Learning Experiences
21. Describe the Hering-Breuer reflex and its effect on ventilation.	page 857
22. Explain the influences of higher brain centers upon ventilation.	pages 856-857 figure 22.27
23. Describe cardio-pulmonary responses to chemoreceptor stimulation.	pages 854-856 figure 22.27
24. Define the following terms:  Eupnea Tachypnea Apnea Dyspnea Pneumonia Pleurisy Asthma Hypoxia Hypocapnia Hypercapnia	Chapter 22 and Glossary

Name of Unit: **Chapter 16: The Endocrine System**

Unit Objectives: To study the anatomy & physiology of the endocrine system; to examine different chemical classes of hormones and discuss their mechanisms of action; and to describe disorders of the endocrine system.

Method of Evaluation: Quizzes, Unit Examination

Learning Objectives	Recommended Learning Experiences
The student will be able to:	1. Class Discussion
	2. Textbook Readings:
1. Compare and contrast major organs and function of the endocrine, exocrine, and nervous systems.	page 602 figure 16.1
2. Describe how hormones affect target cells by binding to specific protein receptors. Compare and contrast the difference between circulatory and local hormones.	pages 602-603
3. Examine different chemical classes of hormones to include: <ul style="list-style-type: none"> <li>• Lipid-soluble hormones (steroids, thyroid hormone)</li> <li>• Water-soluble hormones (amines, peptides, proteins, and eicosanoids)</li> </ul> Provide examples of hormones from each chemical class.	page 603
4. Provide examples of effects of hormone action on human body cells. Compare and contrast primary mechanisms of action of lipid-soluble hormones by direct gene activation to second messenger activation by water-soluble hormones.	pages 603-606 figures 16.2-16.3
5. Provide examples of humoral, hormonal, and neural stimuli for hormone release.	page 607 figure 16.4
6. Describe the anatomy of the pituitary gland (hypophysis). Understand the relationships between the hypothalamus and the pituitary gland by describing the anatomy and functions of the hypothalamic-hypophyseal tract, and the hypophyseal portal system.	pages 609-611 Focus figure 16.1

Learning Objectives	Recommended Learning Experiences
7. List the different cell types in the anterior pituitary gland and provide examples of the hormones that each cell produces.	pages 614-617 table 16.3
8. For each of the following hormones of the anterior pituitary gland, describe the normal physiological functions, feedback regulatory mechanisms, and disorders which result from imbalances (hypersecretion or hyposecretion) in hormone concentration: <ul style="list-style-type: none"> <li>• Growth hormone (hGH)</li> <li>• Thyroid-stimulating hormone (TSH)</li> <li>• Follicle-stimulating hormone (FSH)</li> <li>• Luteinizing hormone (LH)</li> <li>• Prolactin (PRL)</li> <li>• Adrenocorticotrophic hormone (ACTH)</li> </ul>	pages 614-617 table 16.3
9. Describe the hormones released by the posterior pituitary and their effects.	pages 611-614 table 16.3
10. Describe the body location, and gross and microscopic anatomy of the thyroid gland. Explain how cells of the thyroid follicles synthesize and release thyroid hormone (T4 thyroxine and T3 triiodothyronine) and calcitonin. Describe the primary functions of each hormone and disorders resulting from imbalances.	pages 617-621 figures 16.8-16.10
11. Describe the body location, and gross and microscopic anatomy of the parathyroid glands. Provide examples of the primary functions of parathyroid hormone (PTH). Discuss the roles of PTH and calcitonin in regulating blood calcium levels. Describe common symptoms associated with hyperparathyroidism and hypoparathyroidism.	pages 621-622 figures 16.11-16.12

Learning Objectives	Recommended Learning Experiences
<p>12. Describe the body location, and gross and microscopic anatomy of the adrenal glands. Describe the cellular organization of the adrenal cortex (zona glomerulosa, zona fasciculata, and zona reticularis), the principle hormones produced by each layer, and the action of these hormones:</p> <ul style="list-style-type: none"> <li>• Mineralocorticoids (aldosterone)</li> <li>• Glucocorticoids (cortisol)</li> <li>• Gonadocorticoids (androgens)</li> </ul> <p>Explain the cellular organization of the adrenal medulla, and discuss the functions of the catecholamines (epinephrine and norepinephrine). Discuss the homeostatic imbalances of the adrenal gland hormones.</p>	<p>pages 623-627  figures 16.13-16.15  table 16.5</p>
<p>13. Describe the body location, and compare the microscopic anatomy and functions of the exocrine (acinar cells) and endocrine (islets of Langerhans; alpha cells and beta cells) tissue of the pancreas. Discuss how blood sugar concentration is regulated by insulin and glucagon, and discuss causes and common symptoms of the two primary forms of diabetes mellitus (type I &amp; type II).</p>	<p>pages 630-634  figures 16.16-16.17</p>
<p>14. Describe the location of the pineal gland in the brain, and provide examples of the functions of melatonin.</p>	<p>page 627</p>
<p>15. Discuss the location of the thymus gland and describe functions of the two major classes of thymic hormones: the thymosins and thymopoietins.</p>	<p>page 635</p>
<p>16. Briefly describe hormones produced by organs other than the major endocrine glands, including prostaglandins.</p>	<p>pages 634-635  table 16.6</p>

**Name of Unit:****Chapters 27 and 28: Reproduction and Development****Unit Objectives:**

To demonstrate an understanding of the organ structures and physiological processes involved in human sexual reproduction, and the events which occur during human embryonic and fetal development.

**Method of Evaluation:** Quizzes, Unit Examination, Laboratory Performance

<b>Learning Objectives</b>	<b>Recommended Learning Experiences</b>
The student will be able to:	1. Class Discussion 2. Textbook Readings 3. Laboratory Experiences:
1. Distinguish between primary sex organs (or gonads) and accessory reproductive organs, and their respective functions in males and females.	page 1042
2. Describe the body location, gross anatomy, and microscopic anatomy of the testis. Discuss the roles of the different cell types in spermatogenesis and androgen production: <ul style="list-style-type: none"> <li>• spermatogenic cells</li> <li>• sustentocytes (Sertoli cells)</li> <li>• interstitial endocrine cells (Leydig cells)</li> </ul>	pages 1048, 1054-1055 figures 27.5, 27.7, 27.10
3. Describe the body location, gross and microscopic anatomy, and major functions of organs of the male duct system (epididymis, ductus (vas) deferens, ejaculatory duct, and urethra) and accessory sex glands (seminal glands, prostate, and bulbourethral glands).	pages 1047, 1052-1053 figure 27.5
4. Describe the composition and characteristics of human male seminal fluid.	page 1053
5. Describe the gross anatomy, vasculature and innervation of the penis, and discuss anatomical and physiological processes of male sexual responses involved in erection and ejaculation.	pages 1050-1054 figure 27.8
6. Review somatic cell division by mitosis and compare this process to gamete production by meiosis. Describe the events of spermatogenesis to include a description of different germ cell types produced during the process. Understand the role of spermiogenesis in the structural development of spermatozoa.	pages 1054-1058 figures 27.10-27.12
7. Describe the structure of the sperm cell. Trace the path of spermatozoa as they traverse the reproductive system ducts from the site of formation to the site of release from the body.	pages 1047, 1057-1058 figure 27.12

Learning Objectives	Recommended Learning Experiences
8. Discuss the roles of the hormones GnRH, LH, FSH, testosterone, and inhibin in regulating testicular functions, and a description of feedback control. Provide examples of physiological effects (pre-and post-pubertal) of androgens in the human male.	pages 1059-1060 figure 27.13 table 27.2
9. Describe the body location, gross anatomy, and microscopic anatomy of the ovaries. Discuss the functions of the different cell types in oogenesis and female sex steroid production.	pages 1060-1062 figure 27.17
10. Describe the body location, gross and microscopic anatomy, and major functions of organs of the female duct system (uterine tubes, uterus, and vagina), female external genitalia (mons pubis, labia, clitoris, and greater vestibular glands/Bartholin' glands), and mammary glands.	pages 1062-1067 figures 27.17-27.20
11. Describe the events of oogenesis; compare and contrast oogenesis to spermatogenesis. List and describe stages involved in follicle development.	pages 1069-1073 figures 27.22-27.23
12. Provide a detailed description of the hormonal regulation, phases, and physiological events of both the ovarian and the uterine (menstrual) cycles. Discuss relationships between each cycle and the feedback mechanisms that regulate ovarian function. Compare anatomical and physiological changes that occur in each cycle if an egg is fertilized or not fertilized.	pages 1073-1078 figures 27.24-27.25
13. List and describe cellular sources and physiological effects (pre-and post-pubertal, menopausal) of estrogens and progesterone in the human female.	page 1078 table 27.2
14. Define the terms pregnancy, gestation period, zygote, embryo, and fetus as related to human development.	pages 1092-1093
15. Discuss physiological events which lead to sperm penetration of an oocyte and fertilization.	pages 1093-1096 figure 28.3 Focus figure 28.1

Learning Objectives	Recommended Learning Experiences
16. Trace the path of a mature egg from its release by the ovary to its arrival in the uterus. Discuss factors that facilitate movement of the egg.	pages 1097-1098 figure 28.4
17. Provide examples of several morphological or physiological causes of male and female infertility.	pages 1058, 1119
18. Discuss methods of birth control and cite their respective modes of action.	pages 1118-1119
19. Describe events of embryonic development to include major stages of cleavage, implantation, and the development of embryonic and maternal tissues which contribute to formation of the placenta.	pages 1097-1102 figures 28.4-28.5, 28.7-28.8
20. Describe the process of gastrulation in the human embryo. Provide examples of organs which are derived from each of the three primary germ layers: <ul style="list-style-type: none"> <li>• ectoderm</li> <li>• mesoderm</li> <li>• endoderm</li> </ul>	pages 1102-1107 figures 28.9, 28.13

*The syllabus is intended to give student guidance in what may be covered during the semester and will be followed as closely as possible. However, the faculty member reserves the right to modify, supplement, and make changes as the need arises.*