LIFE AND PHYSICAL SCIENCES
Student Learning Outcome Alignment Form

Course Prefix/Number: BIOL 1309

Course Title: Biology for Non Science Majors II

Core Objective	Course SLO	General Learning Activities	Assessment
Critical Thinking Skills	SLO #4) Describe basic animal physiology and homeostasis as maintained by organ systems.	Lab 18—Students study homeostasis in the lung, liver, and kidney. For the liver, the students are given three different blood sugar levels and are asked to determine the concentration of sugars before and after meals in various vessels and arteries. Students submit written lab reports and work in groups of 4. See Attached Activity.	Exam questions. See attached rubric
Communication Skills	SLO #4) Describe basic animal physiology and homeostasis as maintained by organ systems.	Lab 18—Students study homeostasis in the lung, liver, and kidney. For the liver, the students are given three different blood sugar levels and are asked to determine the concentration of sugars before and after meals in various vessels and arteries. Students submit written lab reports and work in groups of 4. See attached activity	Exam questions. See attached rubric
Empirical & Quantitative Skills	SLO #4) Describe basic animal physiology and homeostasis as maintained by organ systems.	Lab 18—Students study homeostasis in the lung, liver, and kidney. For the liver, the students are given three different blood sugar levels and are asked to determine the concentration of sugars before and after meals in various vessels and arteries. Students submit written lab reports and work in groups of 4. See attached activity	Exam questions. See attached rubric

Teamwork	SLO #4) Describe basic animal physiology and homeostasis as maintained by organ systems.	Lab 18—Students study homeostasis in the lung, liver, and kidney. For the liver, the students are given three different blood sugar levels and are asked to determine the concentration of sugars before and after meals in various vessels and arteries. Students submit written lab reports and work in groups of 4. See attached activity.	Exam questions. See attached rubric

CRITICAL THINKING VALUE RUBRIC

Adapted for Texarkana College from the AAC&U Critical Thinking VALUE Rubric

Definition

Critical thinking is a habit of mind characterized by the comprehensive exploration of issues, ideas, artifacts, and events before accepting or formulating an opinion or conclusion.

	Does Not Meet Any Expectations 1	Meets Few Expectations 2	Meets Expectations 3	Exceeds Some Expectations 4	Exceeds All Expectations 5
Explanation of Issues	Did not state issue.	Issue is stated without clarification or description.	Issue is stated but description leaves some terms undefined, ambiguities unexplored, boundaries undetermined and/or backgrounds unknown.	Issue is stated, described, and clarified so that understanding is not seriously impeded by omissions.	Issue is stated clearly and described comprehensively, delivering all relevant information necessary for full understanding.
Evidence	Does not identify the basic components of an issue	Information is taken from sources without any interpretation. Viewpoints of experts are taken as fact, without question	Information is taken from sources with some interpretation but not enough to develop a coherent analysis or synthesis.	Information is taken from sources with enough interpretation to develop a coherent analysis or synthesis.	Information is taken from sources with enough interpretation to develop a comprehensive analysis or synthesis.
Influence of Context and Assumptions	Did not show awareness of the issue.	Show an emerging awareness of present assumptions.	Questions some assumptions. Identifies relevant information when presenting a position.	Identifies own and others' assumptions and several relevant contexts when presenting a position.	Thoroughly analyzes own and others' assumptions and carefully evaluates the relevance of contexts when presenting a position.

Student's Position	Takes no position on issue	Specific position is stated but is simplistic and obvious.	Specific position acknowledges different sides of an issue.	Specific position takes into account the complexities of an issue. Others' points of view are acknowledged within position.	Specific position is imaginative. Limits of position acknowledged. Other points of view are synthesized.
Conclusions and Related Outcomes	Does not use previously learned information in new situations.	Conclusion is inconsistently tied to some of the information discussed; related outcomes are oversimplified.	Conclusion is logically tied to information; some related outcomes are identified.	Conclusion is logically tied to a rage of information, including opposing viewpoints; related outcomes are identified clearly	Conclusions and related outcomes are logical and reflect student's informed evaluation and ability to place evidence and perspectives discussed in priority order

Communication RUBRIC

Adapted for Texarkana College from the AAC&U Critical Thinking VALUE Rubric and Making Learning Real

Definition

Written communication is the development and expression of ideas in writing.
Oral Communication is a prepared, purposeful presentation designed to increase knowledge, to foster understanding, or to promote change in the listeners' attitudes, values, beliefs, or behaviors.
Visual Communication is the use of images to persuade, entertain, inform, and enlighten an observing audience of products, ideas, and messages.

	Does Not Meet Any Expectations 1	Meets Few Expectations 2	Meets Expectations 3	Exceeds Some Expectations 4	Exceeds All Expectations 5
Quality of Information and Organization	Presentation lacks main points and related details. Information lacks connection to the presentation topic. Information is not organized.	Main points are not clear and lack significant detail. Some information is linked to the presentation topic. Information is loosely organized.	Main points are somewhat clear but could use more detail. Most information is linked to the presentation topic. Information is organized.	Main points are clear and detailed. Information is linked to presentation topic. Information is well organized.	Main points are very clear and very detailed. Information is directly linked to presentation topic. Information is very organized.
Nonverbal Communication	Speaker appears very uneasy and insecure. Speaker faces away from the audience or makes no eye contact. Speaker appears disengaged from the audience. Speaker uses few body motions or gestures or has gestures or movements that distract the audience.	Speaker appears uneasy and somewhat insecure. Speaker rarely faces the audience or makes eye contact. Speaker rarely appears to be engaging with the audience. Speaker uses few body motions or has gestures or movements that distract the audience..	Speaker appears generally at ease and confident. Speaker sometimes faces the audience and maintains eye contact. Speaker sometimes appears to be engaging with the audience. Speaker's body motions and gestures neither support nor detract from presentation.	Speaker appears fairly comfortable and confident. Speaker generally faces the audience and maintains good eye contact. Speaker generally appears to be engaging with the audience. Speaker uses body motions and gestures well.	Speaker appears very comfortable and confident. Speaker consistently faces the audience and maintains good eye contact. Speaker consistently appears to be engaging with the audience. Speaker uses body motions and gestures very effectively.

Quality of Verbal Communication	Speaker's voice is consistently too weak or too strong. Speaker fails to use inflections to emphasize key points and create interest or often uses inflections inappropriately. Speaker's talking paces is consistently too slow or too fast.	Speaker's voice is frequently too weak or too strong. Speaker rarely uses inflections to emphasize key points and create interest or speaker sometimes uses inflections inappropriately. Speaker's talking pace is often too slow or too fast.	Speaker's voice is generally steady strong and clear. Speaker sometimes uses inflections to emphasize key points and create interest. Speaker's talking pace is appropriate.	Speaker's voice is steady, strong, and clear. Speaker often uses inflections to emphasize key points and create interest. Speaker's talking pace is mostly appropriate.	Speaker's voice is very confident, steady, strong, and clear. Speaker consistently uses inflections to emphasize key points or to create interest. Speaker's talking pace is consistently appropriate.
Visual Tools	Visual aids demonstrate no creativity or clarity and are often difficult to read. Presentation is weakened by the visual tools.	Visual aids have limited creativity or clarity or are sometimes difficult to read. Presentation is not enhanced by the visual tools.	Visual aids are reasonably creative, clear, and easy to read. Presentation is sometimes enhanced by the visual tools.	Visual aids are usually creative, clear, and easy to read. Presentation is often enhanced by the visual tools.	Visual aids are very creative, clear, and easy to read. Presentation is consistently enhanced by the visual tools.
Appropriate Use of Vocabulary	Few or no terms are included in the presentation. May or may not be used appropriately. Lacks context.	Several terms are included in the presentation. May or may not be used appropriately. May lack context.	Most terms are included in the presentation. Generally used appropriately. Generally used in appropriate context.	All terms are included in the presentation. Used effectively. Used in context.	All terms are included in the presentation. Used in unique and creative ways. Used in context
Precision and Detail in Documents Produced	Written documents have numerous errors and lack detail. Little carte taken in the production.	Documents may have some errors and show some detail. Some care has been taken in production.	Evident that written documents are correct and show a general attention to detail and accuracy. General care has been taken in production.	Clearly evident that written documents are correct, detailed and accurate. Care has been taken in production.	Documents are clear, well-constructed, accurate, and show attention to detail. Extra care has been taken in the production of written documents.

Overall Presentational Effectiveness	The presentation was weak and not effective.	The presentation was average and somewhat effective.	The presentation was good and effective.	The presentation was very good and effective.	The presentation was exceptional and extremely effective.

Empirical and Quantitative Skills RUBRIC

Adapted for Texarkana College from the AAC&U Critical Thinking VALUE Rubric

Definition

The ability to formulate an inquiry that is scientific or mathematical in nature, and then manipulate and analyze numerical data and/or follow an investigative process using empirical and/or quantitative reasoning to satisfy the inquiry and create informed conclusions.

	Does Not Meet Any Expectations 1	Meets Few Expectations 2	Meets Expectations 3	Exceeds Some Expectations 4	Exceeds All Expectations 5
Identification	The purpose, components, and variables of the investigation/project are not identified.	The purpose, components, and variables of the investigation/project are somewhat identified.	The purpose, components, and variables of the investigation/project are mostly identified	The purpose, components, and variables of the investigation/project are clearly identified..	The purpose, components, and variables of the investigation/project are clearly identified.
Assimilation	The information that is required for an analysis of all investigative components is not evident. If applicable, values are incorrectly translated into variables and no necessary formulas are present.	The information that is required for an analysis of all investigative components is somewhat evident. If applicable, values are incorrectly translated into variables and some necessary formulas are present.	The information that is required for an analysis of all investigative components is mostly evident. If applicable, some values are correctly translated into variables and most necessary formulas are present.	The information that is required for an analysis of all investigative components is evident. If applicable, most values are correctly translated into variables and all necessary formulas are present.	The information that is required for an analysis of all investigative components is clearly evident. If applicable, values are correctly translated into variables and all necessary formulas are present.
Analysis	Most investigative or quantitative components are not scrutinized. The	Some investigative or quantitative components are scrutinized. Some	All investigative or quantitative components are somewhat	All investigative or quantitative components are scrutinized. The	All investigative or quantitative components are methodically

	steps followed are illogical and/or irrelevant to the desired result. The proper tools/ technology were not used and/or integrated into the final product. Any notation is not consistent and not defined.	steps followed are somewhat logical and relevant to the desired result. The proper tools/ technology were somewhat used and not integrated into the final product. Any notation is somewhat consistent but not defined.	scrutinized. The steps followed are mostly logical and relevant to the desired result. The proper tools/ technology were mostly used and somewhat integrated into the final product. Any notation is mostly consistent and defined.	steps followed are logical and relevant to the desired result. The proper tools/ technology were used and mostly integrated into the final product. Any notation is consistent and well defined.	scrutinized. The steps followed are logical and relevant to the desired result. The proper tools/ technology were used and well integrated into the final product. Any notation is consistent and well defined.
Presentation	A summary of the analysis is either inadequately presented or not presented at all. The presented information is mostly incorrect, and/or of poor quality, and/or the terminology/figures are inaccurate and/or hard to understand. Few or no visual representations of evidence are acceptably scaled/ represent the analysis findings.	A partial summary of the analysis is presented. The presented information is somewhat correct, of adequate quality, and the terminology/figures are somewhat accurate and relatively easy to understand. Some visual representations of evidence are acceptably scaled and represent the analysis findings.	A summary of the analysis is presented. The presented information is mostly correct, of good quality, and the terminology/figures are mostly accurate and easy to understand. Most visual representations of evidence are acceptably scaled and represent the analysis findings.	A good summary of the analysis is presented. The presented information is correct, of good quality, and the terminology/figures are accurate and easy to understand. Most visual representations of evidence are well-scaled and/or well represent the analysis findings..	A concise summary of the analysis is presented. The presented information is correct, of high quality, and the terminology/figures are accurate and easy to understand. All visual representations of evidence are well-scaled and well represent the analysis findings.
Application	The integration does not include all steps of the investigation and does not lead to an accurate, nor complete conclusion	The integration of most steps of the investigation lead to a somewhat accurate, partially complete conclusion that is	The coherent integration of most steps of the investigation lead to an accurate, mostly complete, acceptable conclusion that is	The coherent integration of all steps of the investigation lead to an accurate, mostly complete, relevant conclusion that is	The coherent integration of all steps of the investigation lead to an accurate, complete, relevant conclusion that

	that relates to the initial investigative argument.	relative to the initial investigative statement.	relative to the initial investigative statement.	relative to the initial investigative statement.	is relative to the initial investigative statement.

Teamwork Skills RUBRIC

Adapted for Texarkana College from the AAC&U Critical Thinking VALUE Rubric

Definition

Teamwork is behaviors under the control of individual team members, their manner of interacting with others on team, and the quantity and quality of contributions they make to team discussions.

	Does Not Meet Any Expectations 1	Meets Few Expectations 2	Meets Expectations 3	Exceeds Some Expectations 4	Exceeds All Expectations 5
Contributes to Team Meetings	Does not collect any relevant information; no useful suggestions to address team's needs;	Shares ideas but does not advance the work of the group.	Offers new suggestions to advance the work of the group	Offers alternative solutions or courses of action that build on the ideas of others.	Helps the group move forward by articulating the merits of alternative ideas or proposals
Facilitates the Contributions of Team Members	Often argues with team mates; doesn't let anyone else talk; occasional personal attacks and "put-downs"; wants to have things done his way and does not listen to alternate approaches;	Engages group by taking turns and listening to others without interrupting.	Engages group by restating the views of other members and/or asking questions for clarification.	Engages group by constructively building upon or synthesizing the contributions of others..	Engages group by both constructively building upon and synthesizing the contributions of others as well as noticing when someone is not participating and inviting him/her to engage.

Individual Contributions Outside of Team Meetings	Completes no assigned tasks outside of team meetings.	Completes some assigned tasks by deadline.	Completes all assigned tasks by deadline; work accomplished advances the project.	Completes all assigned tasks by deadline; work accomplished and is thorough, comprehensive, and advances the project.	Completes all assigned tasks by deadline; work accomplished is thorough, comprehensive, and advances the project. Proactively helps other team members complete their assigned tasks to a similar level of excellence.
Fosters Constructive Team Climate	Is argumentative and does not work with the team.	Supports a constructive group climate by treating other members respectfully.	Supports a constructive group climate by treating other members respectfully and conveying a positive attitude about the group and its work.	Supports a constructive group climate by treating other members respectfully, conveying a positive attitude about the group and its work, and motivating other group members.	Supports a constructive group climate by treating other members respectfully, conveying a positive attitude about the group and its work, motivating other group members, and providing assistance to group members.
Responds to Conflict	Is not present enough to engage in conflict.	Passively accepts alternate viewpoints/ideas/opinions.	Redirects focus toward common ground, toward task	Identifies and acknowledges	Addresses conflict directly and helps to manage/resolve it in a way that strengthens

			at hand (away from conflict)..	conflict and stays engaged with it.	overall group cohesiveness.

Syllabus: Concepts of Biology
Course Number: BIO 1408

Semester & Year: Spring 2013

Instructor Information

Name: Patricia L. Harman
Office: CHEM 225
Telephone: 903-823-3392
E-mail: patricia.harman@texarkanacollege.edu

Office Hours: 12:30–2:00 Monday-Thursday, 2:00–4:00 Wednesday, & 10-12 Friday

A schedule of my class and office hours is posted next to the door of my office. If I am not in office, check the chemistry labs. I am generally in the chemistry building when not in class. Do not hesitate to come by and see me if you need additional assistance.

Textbook Information

Inquiry into Life, 13th Edition, by Sylvia Mader, ISBN 978-0-07-340344-1

This text is also used for Biology 1409.

Inquiry into Life, 13th Edition Laboratory Manual, by Sylvia Mader, ISBN 978-0-07-729743-5, is **required** (also used both semesters).

Additional learning materials may be provided by instructor.

http://www.mhhe.com/maderinquiry13

Student Learning Outcomes for the Course

1. Develop an understanding of human interrelationships with the environment.
2. Recognize common chemical reactions that occur in extracellular and intracellular environments.
3. Recognize and describe the functional roles of organic molecules associated with living organisms.
4. Demonstrate comprehension of cell structure and function by recognition of cellular components and organelles and their roles in cell physiology.
5. Describe the processes which regulate movements of solute particles into and out of cells.
6. Describe the sequence of activities that occur in the cell cycle.

Student Requirements for Completion of the Course and Due Dates

Student progress in this course will be based on performance on lecture exams and projects and your laboratory grade.

7. Recognize the activities that occur in mitosis and meiosis and contrast these cellular divisions.

8. Describe the reactants, pathways, and end products that constitute cellular metabolism.

9. Describe the process of photosynthesis in autotrophic organisms.

10. Recognize and describe both morphologically and microscopically the root and stem structures in plants, including complete and incomplete flowers and natural and artificial reproduction methods.

11. Identify the types of tissues found in plants and explain their function.

12. Identify plant growth regulators that occur in plants and give the functions they perform.

13. Give the structural characteristics of viruses and subviroids including life cycles and their impact on cellular organisms.

14. Give the structural characteristics of representatives of viruses and prions, domains, Archae and Bacteria, Eukarya (Protists and Fungi) and describe their life cycles. State the ecological and economic significance of Kingdom Plantae.

15. Identify and recognize characteristic features of various phyla of the Animal Kingdom and give their impact economically and ecologically.

16. Describe the three basic patterns of interactive behavior that occur in populations and explain the impact that these relationships have within particular ecosystems.

17. Describe the terrestrial biomes found on earth in terms of climatic conditions, location, and species composition.

18. Describe the common aquatic communities by location and composition.

19. Describe the nature and composition of ecosystems and explain the process of energy flow and cycling.

20. Explain the need of environmental awareness on earth today as it relates specifically to resource conservation, population growth, and environmental quality.

***Lecture grade**:* Lecture exams will cover all material assigned in the textbook, all the material covered in lecture, and any other assigned material. There are normally six major examinations administered during this semester. This includes the final exam and all are equally weighted. They will be comprehensive in nature and will consist of objective questions, short answer, labeling diagrams, and essays. Most exams will be taken in the Testing Center. The lecture component will contribute **70%** of your final grade.

***Laboratory grade**:* The laboratory grade will consist of any lab exams, lab reports, and projects. Your laboratory performance accounts for **30%** of your final grade.

Make-up exams & missed assignments: Make-up **lecture** exams will only be given when the student has an excuse deemed acceptable by the instructor. Students will have one week in which to take a make-up examination in the testing center. It is the responsibility of the student to contact the instructor and arrange to make-up any missed work. Work not completed will be assigned a grade of 0. **There are NO dropped exam grades in lecture and students are allowed only one make-up exam.**

Extra credit: There will be opportunities to acquire extra credit in lecture and lab. Special projects or activities will be offered in lecture. Some labs require materials or supplies that students may bring from home for extra credit. All opportunities will be discussed in class.

Exams will be given about every three weeks. The following list indicates what chapters are normally included on each exam.

Test 1 – Chapter 1, The Study of Life and portions of Chapters 33, 34, 35, and 36 (Behavior and Ecology), and Chapter 2, The Molecules of Cells

Test 2 – Chapter 3 (Cell Structure), Chapter 4 (Membrane Structure and Function), and Chapter 5 (Cell Division)

Test 3 –Chapter 6 (Metabolism: Energy and Enzymes), Chapter 7 (Cellular Respiration), and Chapter 8 (Photosynthesis)

Test 4 – Chapters 9, 10, and 29 – All chapters on Kingdom Plantae

Test 5 – Chapter 28 (Microbiology) and Chapters 30 & 31 (Kingdom Animalia)

Test 6 – FINAL EXAM – Comprehensive final that includes all material previously studied.

Student Assessment

***Lecture grade**:* Lecture exams will cover all material assigned in the textbook, all the material covered in lecture, and any other assigned material. There are normally six major examinations administered during this semester. This includes the final exam and all are equally weighted. They will be comprehensive in nature and will consist of objective questions, short answer, labeling diagrams, and essays. Most exams will be taken in the Testing Center. The lecture component will contribute **70%** of your final grade.

***Laboratory grade**:* The laboratory grade will consist of any lab exams, lab reports, and projects. Your laboratory performance accounts for **30%** of your final grade.

Extra credit: There will be opportunities to acquire extra credit in lecture and lab. Special projects or activities will be offered in lecture. Some labs require materials or supplies that students may bring from home for extra credit. All opportunities will be discussed in class.

Grading Scale

A standard grade scale will be used to assign final course grades.

90%+ - A 80% - B 70% - C 60% - D < 60% - F

Class Schedule – this is a tentative schedule and subject to change.

Date	Material to be covered	Assignment
Jan. 23	Go over class syllabus, course pre-test	Read chapter 1
Jan. 28-30	Chapter 1 lecture	Read assigned sections

Feb. 4-6	Chapters 33, 34, 35, & 36 lecture	Read Chapter 2
Feb. 11-18	Chapter 2 lecture	Read Chapter 3 Study for Exam 1
Feb. 20-25	Chapter 3 lecture	Read Chapter 4
Feb. 27-March 4	Chapter 4 lecture	Read Chapter 5
March 6-18*	Chapter 5 lecture	Read Chapter 6 Study for Exam 2
March 20	Chapter 6 lecture	Read Chapter 7
March 25-27	Chapter 7 lecture	Read Chapter 8
April 1-3	Chapter 8 lecture	Read Chapter 28 Study for Exam 3
TBD	Chapters 9, 10, & 20	Exam 4
April 10-17	Chapter 28 lecture	Read Chapters 30-31
April 22-May 1	Chapters 30-31 lecture	Study for Exam 5
May 6	Exam 5	
May 7	Final Review	Study for Final Exam
May 13-16	FINAL EXAMS	

***Spring Break is March 11-15**

ABSENTEE POLICY

Texarkana College's absentee policy allows instructors to withdraw a student from a course due to excessive absences. If a student leaves and returns during class or leaves the class before the class is over, he/she **may** be considered absent. Three tardies constitute one absence. It is the student's responsibility to check the syllabus for each instructor's tardy policy.

In some workforce/vocational areas, such as nursing and cosmetology, certification requirements necessitate an absentee policy that is more stringent than the institutional policy. In these instances, the matter of certification takes precedence over local policies, since certification policies are established by the State of Texas.

Faculty members **are not** obligated to provide opportunities for students to make-up missed assignments and tests as a result of a student's absence from class. The institution is not required to take attendance with the exception of workforce/vocational areas,

where certification requirements require taking attendance. However, experience demonstrates that regular attendance enhances academic success. As such, students are expected to attend each meeting of their registered courses.

A student should not stop attending a class without formally withdrawing from the course by the institutions published Last Day for Students to Drop. If a student stops attending class after the published Last Day for Students to Drop, the student **may** receive a grade of "F" in the class. The instructor will submit the last date of attendance for students receiving a grade of "F" or "W".

Withdrawal from a course(s) **may** affect a student's current or future financial aid eligibility. Students should consult the Financial Aid Office to learn both short and long term consequences of a withdrawal.

EXCUSED ABSENCES

A student's absence due to school trips and/or school business will not be counted against a student's allowable number of absences. Military duty and absences for Holy Days (FBD LEGAL) are covered in a separate section of the catalog and the student handbook. These are the only excused absences that are considered by Texarkana College. Responsibility for work missed for any absence is placed on the student. Instructors are required to allow students to make up work missed if the absence is due to military duty* or religious holy days when students follow the correct notification procedures. Instructors are not required to allow students to make up work for absences due to other reasons. Make-up policies are listed in each individual instructor's syllabus.

**Students interested in Health Occupations should check with the division chair prior to entering the program.*

ONLINE/HYBRID COURSE ABSENCES

Absence in an **online course** is defined as the lack of an active post or submission within the course including discussion board posts, written assignments, and tests. This standard will be used to determine all absentee issues, including but not limited to, 12th Day Census Reports, last date of attendance, and involuntary withdrawal from a course due to absences. All online students must complete an Enrollment Verification activity within the first week of class (activity depends upon the professor); otherwise the professor **may** drop the student for not having attended. Students must complete at least one activity in their online class per week. Each week in which a student does not complete an activity will be counted as an absence.

If a student is taking a hybrid course, and it does not meet during the first week of class, the student must also complete an Enrollment Verification activity within the first week of class; otherwise the student **may** be dropped for not having attended.

MAXIMUM ALLOWABLE ABSENCES

After official registration, the following number of unexcused absences will be the maximum allowable before a student **may** be dropped from the class. Mandated program certification requirements detailed for certain programs regarding the maximum allowable unexcused absences takes precedence over the following information.

Academic Classes

A COURSE THAT MEETS FOR THE FULL 16 WEEK SEMESTER	
Class or Lab Meets:	An instructor **may** withdraw a student from a course if absences exceed:
Once a week (Night classes or Friday classes)	2
Twice a week (MW or TR classes)	4
Three times a week (MWF or TRF classes)	6
Four times a week (MTWR classes)	8

	Three tardies count as one absence
A COURSE THAT MEETS FOR 14 WEEKS OF THE SEMESTER	
Class or Lab Meets: Twice a week (MW or TR classes)	An instructor **may** withdraw a student from a course if absences exceed: 4 Three tardies count as one absence.
A COURSE THAT MEETS FOR 8 WEEKS OF THE SEMESTER (Fast-Track)	
Class or Lab Meets: Four times a week (MTWR classes)	An instructor **may** withdraw a student from a course if absences exceed: 4 Three tardies count as one absence.
A COURSE THAT MEETS FOR 5 WEEKS OF THE SEMESTER (Summer Sessions)	
Class or Lab Meets: 3 times a week (MTW) (evening classes) 4 times a week (MTWR) (day classes)	An instructor **may** withdraw a student from a course if absences exceed: 2 2 Three tardies count as one absence.

MAKE-UP POLICY

Make-up **lecture** exams will only be given when the student has an excuse deemed acceptable by the instructor. Students will have one week in which to take a make-up examination in the testing center. It is the responsibility of the student to contact the instructor and arrange to make-up any missed work. Work not completed will be assigned a grade of 0. **There are NO dropped exam grades in lecture and students are allowed only one make-up exam.**

Academic Dishonesty Policy

Scholastic dishonesty, involving but not limited to cheating on a test, plagiarism, collusion, or falsification of records will make the student liable for disciplinary action after being investigated by the Dean of Students. Proven violations of this nature will result in the student being dropped from the class with an "F".

This policy applies campus wide, including TC Testing Center, as well as off-campus classroom or lab sites, including dual credit campuses. This information can be found in the Student Handbook at https://texarkanacollege.edu/PDFFiles/CurrentStudents/studenthandbook.pdf.

Disability Act Statement:

Texarkana College complies with all provisions of the Americans with Disabilities Act and makes reasonable accommodations upon request. Please contact Larry Andrews at 903.823.3283, or go by the Recruitment, Advisement, and Retention Department located in the Administration building for personal assistance.

If you have an accommodation letter from their office indicating that you have a disability which requires academic accommodations, please present it to me so we can discuss the accommodations that you might need for this class. *It is best to request these changes at the beginning if not before the start of class* so there is ample time to make the accommodations..

Financial Aid:

Attention! Dropping this class may affect your funding in a negative way! You could owe money to the college and/or federal government. Please check with the Financial Aid office before making a decision.

Class Conduct

Students are expected to conduct themselves as adults. Any student who acts in such a manner as to disturb class and interfere with the learning process will be expelled from the course with a grade of "F".

Regulations regarding cell phones and other electronic devices will be enforced. These are a distraction to the learning process and should be turned off BEFORE coming to class. These devices should be out of sight and not accessed during the class period.

Course Objectives

1. *Satisfy the lab science requirement for non-science majors.*
2. *Provide the student with sufficient background and knowledge, which should enable him/her to successfully complete more advanced courses in life science.*
3. *Enable the student to acquire some basic learning processes that may be extended and applied to other disciplines.*

4. *Encourage the development of an appreciation of all living things and the interconnected relationships man has with all living organisms.*
5. *Develop a clear concept of the scientific method and its application in social issues.*

This course examines the process and method of science applied to understanding biological concepts at the molecular, cellular, organism, and community levels. There is a survey of major groups of organisms with respect to their diversity in organization, processes, interactions, and adaptations including human impact on the environment. The scientific method and social applications of scientific information to related human issues are stressed throughout the course. (This course is designed and recommended for non-science majors.)

Instructional Methods and Materials

This course meets for three hours of lecture/discussion and three hours of laboratory each week. A traditional lecture/discussion method will be the primary means of instruction. Supplementary printed materials, audiovisuals, and other "hands-on" materials or activities may be used to enhance learning and understanding. The chapters to be covered in this course are:

Chapters 1-10, 28-31 and portions of 33-36. You will need a package of scantrons for lecture exams.

Study guides and printed materials will be delivered to your TC email so you will need to check that account often.

……..

I, (print your name) _____ have read and understand the above information regarding what is expected of each student, the grading scale, attendance policy, and financial aid. If any concerns arise, I understand that I need to speak with my instructor Patricia Harman.

_____

Student signature & date

nt Learning Outcomes (SLO) **1309**
tify the four basic groups of tissues and be able to give the general locations and functions of entative types within each group.
tify the parts of the digestive system and discuss physical and chemical processes occurring in on.
ognize proper nutrition requirements to meet human energy needs and other biological needs.
tify structures and functions of the cardiovascular system components and be familiar with various erative disorders in this system.
tify blood components and their functions, as well as blood typing systems.
tify lymphatic and immune system components, structures and functions.
tify problems associated with the immune system and immune theory.
tify structures and functions of the respiratory system and diseases associated with its components.
tify structures and functions of the excretory system, including urine formation, homeostatic roles alfunctions of the system.
ntify structures and functions of the nervous system including neurotransmitter drug actions and
ntify components, know functions and physiology of the muscular and skeletal systems.
familiar with sense organs, their actions, stimulus-response reactions and problems associated with nses.
ntify components of the endocrine system and hormonal actions, including diseases associated with ctions of the glands.
ntify components and identify the underlying physiological processes of the reproductive systems of nd female sexes.
ntify commonly used methods of birth control methods including a comparison of effectiveness.
ntify reproductive problems and possible alternatives for treatment.
mpare causes and effects of sexually transmitted diseases and their treatments.
cuss concepts of human growth and development beginning with a fertilized egg and spanning the n life cycle.
te the Mendalian laws of dominance, segregation of characters and independent assortment; nstrate hypothetical crosses of each and summarize the expected results.
e a pedigree chart to determine the pattern of inheritance of certain human genetic disorders and t potential genetic outcomes.
scribe the roles of DNA and RNA in the molecular basis of heredity.
ntify commonly cited evidences for evolution and biodiversity and discuss the processes involved.
monstrate awareness of environmental influences and impacts on health and well- being of humans.

16

Homeostasis

learning Outcomes

Introduction
- Define homeostasis and the internal environment of vertebrates. 213

16.1 Heartbeat and Blood Flow
- Describe the cardiovascular system and relate the heartbeat cycle to blood pressure and blood flow. 214 17
- Measure blood pressure, and explain the relationship between blood pressure and heart rate. 216-17

16.2 Blood Flow and Systemic Capillary Exchange
- Describe the exchange of molecules across a capillary wall and how this exchange relates to blood pressure and osmotic pressure. 217-18

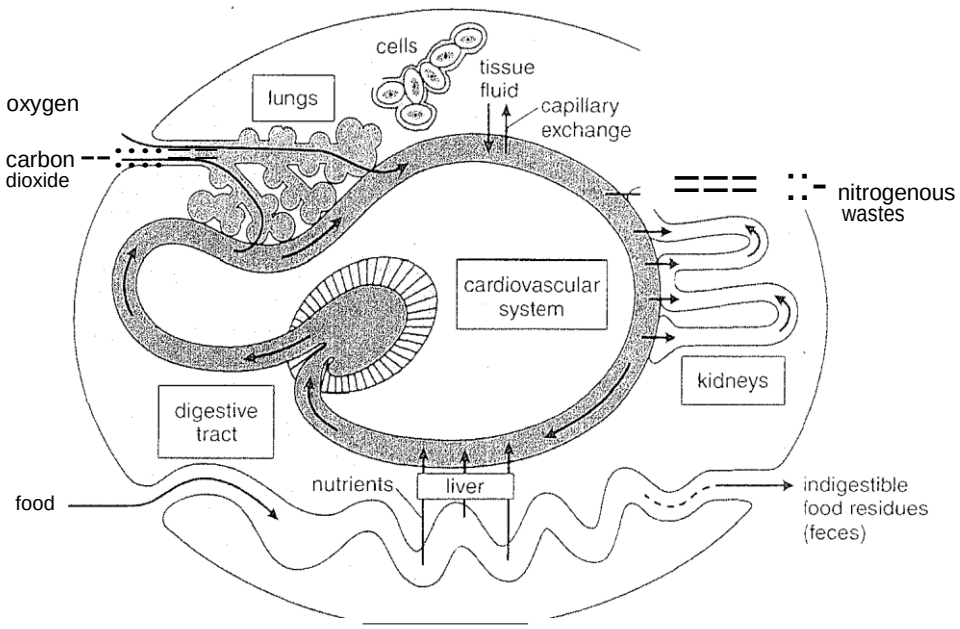
16.3 Lung Structure and Human Respiratory Volumes
- Describe the mechanics of breathing and the role of the alveoli in gas exchange. 218-20
- Measure respiratory volumes (e.g., tidal volume) and explain their relationship to homeostasis. 220-21

16.4 Kidneys
- Understand kidney and nephron structure and blood supply. 222-24
- State the three steps in urine formation and how they relate to the parts of a nephron. 225--26
- Perform a urinalysis and explain how the results are related to kidney functions. 226-27

ntroduction

Homeostasis refers to the dynamic equilibrium of the body's internal environment. The **internal environment** consists of blood and tissue fluid. rille body's cells take nutrients from tissue fluid and return their waste molecules to it. Tissue fluid, in turn, exchanges molecules with the blood. 'This is called capillary exchange. All internal organs contribute to homeostasis, but this laboratory specifically examines the contributions of the blood, lungs, and kidneys (Fig. 16.1).

Figure 16.1 Contributions of -organs to homeostasis.
The lungs exchange gases with blood; the kidneys remove nitrogenous wastes from blood; and the intestinal tract adds nutrients as regulated by the liver to blood.



16.1 Heartbeat and Blood Flow

Recall that the cardiovascular system consists of the heart, blood vessels, and blood (Fig. 16.2). Arteries carry blood away from the heart while veins transport blood toward the heart. Arteries branch into srnaller vessels called arterioles that enter capillary beds. Capillary beds are present throughout the organs and tissues of the body. An exchange of gases takes place across the thin walls ofpuhnonary capillaries.lnthe lungs, $C0_2$ leaves the blood and O_2 enters the blood. An exchange of gases and nutrients for metabolic wastes takes place across the thin walls of systemic capillaries. In the body tissues, O_2 and nutrients exit the blood, while $C0_2$ and rnetabolic wastes enter the blood.

We will see that the heart is vital to homeostasis because its contraction (called the heartbeat) keeps the blood moving in the arteries and arterioles which take blood to the capillaries. 'The exchanges that take place across capillaries help maintain homeostasis.

liver

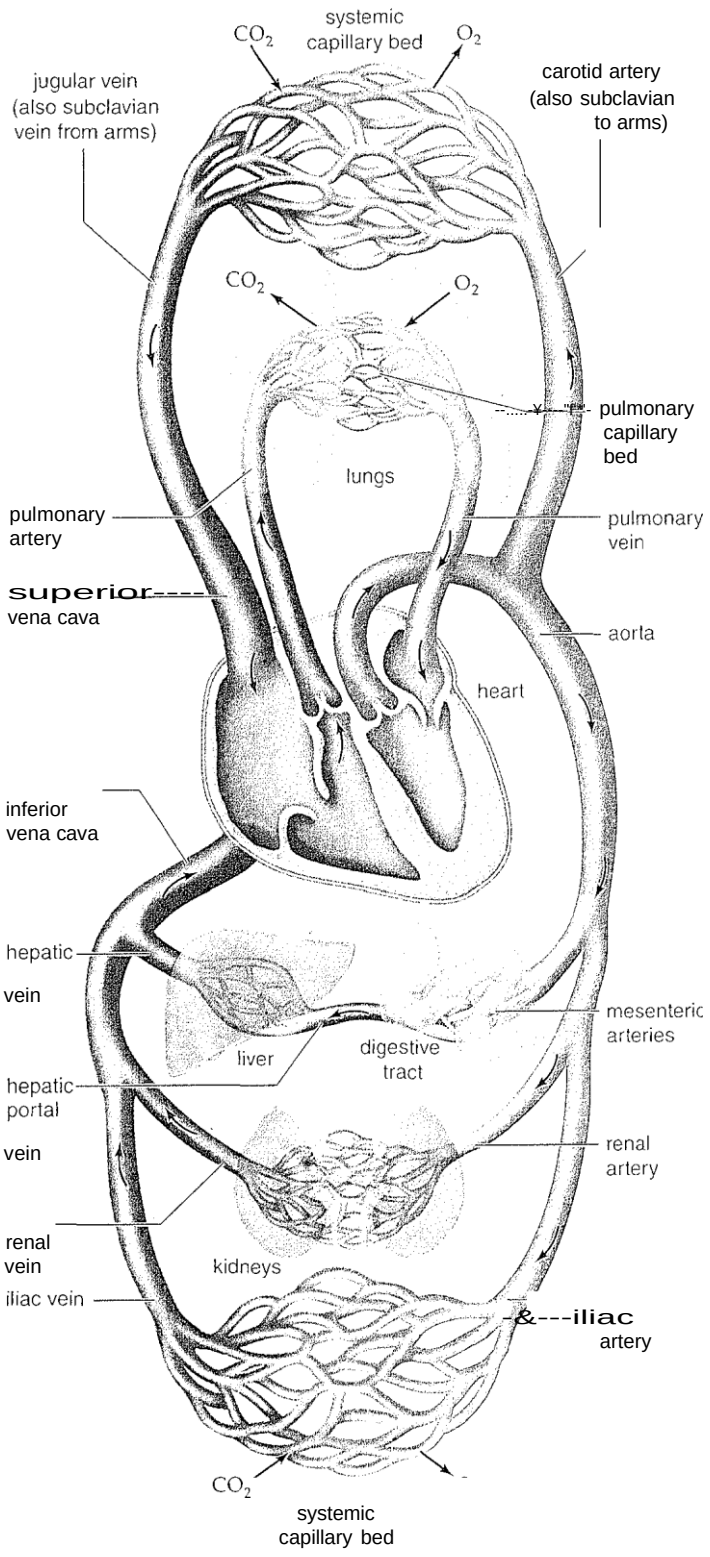
The hepatic portal vein lies between the

— — — _____ and

the _____ —

This placement allows the liver to regulate what molecules enter the blood fron1 the digestive tract. For example, if the hormone insulin is present, the liver removes excess glucose and stores it as glycogen. Later, the liver breaks down glycogen to glucose to keep the glucose concentration constant.

Figure 16.2 The circulatory system.
The heart provides the pumping action that transports the blood through the arteries, capillary beds, and veins.



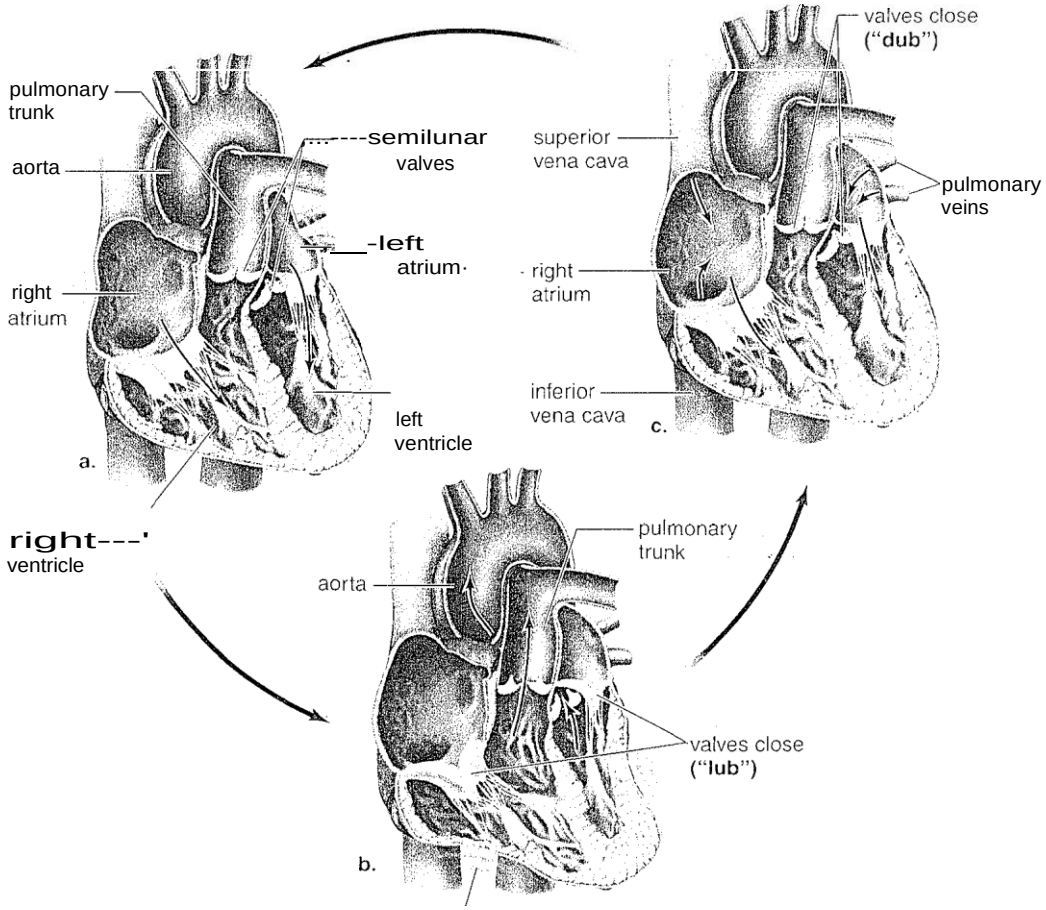
Heartbeat

During a heartbeat, first the atria contract and then the ventricles contract. When a chamber contracts, it is called **systole,** and when a chamber relaxes, it is called **diastole.** The atria and ventricles take turns being in systole.

Time	*Atria*	*Ventricles*
0.15 sec	Systole	Diastole
0.30 sec	Diastole	Systole
0.40 sec	Diastole	Diastole

Usually, there are two heart sounds with each heartbeat (Fig. 16.3). "111e first SOLtnd *(luh)* is low and dull and lasts longer than the second sound. It is caused by the closure of valves following atrial systole. The second sound *(dub)* follows the first sound after a brief pause. l11e sound has a snapping quality of higher pitch and shorter duration. The *duh* sound is caused by the closure of valves following ventricle systole.

Figure 16.3 The heartbeat sounds.
a. When the atria contract (are in systole), the ventricles fill with blood. **b.** Closure of the valves between atria and ventricles results in a **lub** sound. When the ventricles contract, blood enters the attached arteries (aorta and pulmonary trunk).
c. Closure of valves between ventricles and arteries results in a **dub** sound. Blood enters the heart from the attached veins (vena cavas and pulmonary veins) once more.



indicates

contraction

Experimental Procedure: Heartbeat at Rest

ln the following procedure, you will work with a partner and use a stethoscope to listen to the heartbeat. It will not be necessary for you to count the number of beats per minute.

1. Obtain a stethoscope, and properly position the ear-pieces. They sboulcl point forward. Place the bell of the stethoscope on the left side of your partner's chest ben,yeen tbe fourth and fifth ribs. This is where the apex (tip) of the heart is closest to the body wall.
2. Which of the two sounds (lub or dub) is louder?----------
3. Now switch, and your partner will determine your heartbeat.

Blood Pressure

Blood pressure is highest just after ventricular systole (con traction) and it is lowest during ventricular dia ole(, laxation).Why? _____

We would expect a person to l1ave lower blood pressure readings at rest than after exercise. Why?

_____

Experimental Procedure: Blood Pressure and Pulse at Rest and After Exercise

A number of different types of digital blood pressure monitors are available, and your instructor will instruct you on how to u.se the type you will be using for this Experimental Procedure. The resting blood pressure readings for an individual are displayed on the monitor shown in Figure 16.4. A blood pressure reading at or below 120/HO (systolic/diastolic) is considered normal.

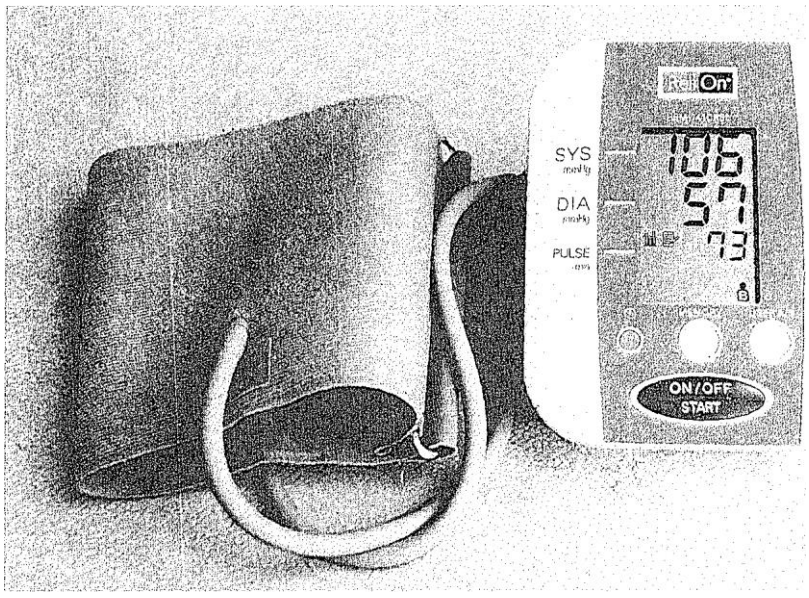


Figure '16.4 Measurement of blood pressure and pulse. There are many different types of digital blood pressure/pulse monitors now available. The one shown here uses a cuff to be placed on the arm. Others use a cuff for the wrist.

During this experirnental procedure you may work with a partner or by yourself. If working with a partner, each of you will assist the other in taking blood pressure readings. When you note the blood pressure readings, also note the pulse reading.

Blood Pressure and Pulse at Rest

1. 1\ecluce your activity as much as possible.
2. Use the blood pressure monitor to obtain several blood pressure readings, average them, and record your results in Table 16.1. Also note the pulse rates and average. Record in Table 16.1.

Blood Pressure and Pulse After Exercise

1. Hun in place for 1 minute.
2. Immediately use the blood pressure monitor to obtain a blood pressure reading, and record it in Table 16.1. Also note the pulse rate and record in Table 16.1.

Table 16.1 Blood Pressure

	Rates at Rest		Rates After Exercise	
	Blood Pressure	Pulse	Blood Pressure	Pulse
Partner				
Yourself'				

Conclusions: Blood Pressure

- Knowing that: exercise increases the heart rate, offer an explanation for your results. _____

_____

- Under what conditions in everyday life would you expect the heart rate and the blood pressure to increase, even though you were not exercising? _____

_____

When might this be an advantage? _____

A disadvantage? _____

16.2 Blood F!ow and Systemic Capillary Exchange

We associate death with lack of a heartbeat, but the real problem is lack of blood flow to the capillaries.

Blood Flow

The beat of the heart moves blood into the aorta, which divides into arterioles, and then arterioles divide into capillaries. Venules, which receive blood from capii!aries, combine t0 form veins, which take blood back to the heart.

Experimental Procedure: Blood Flow

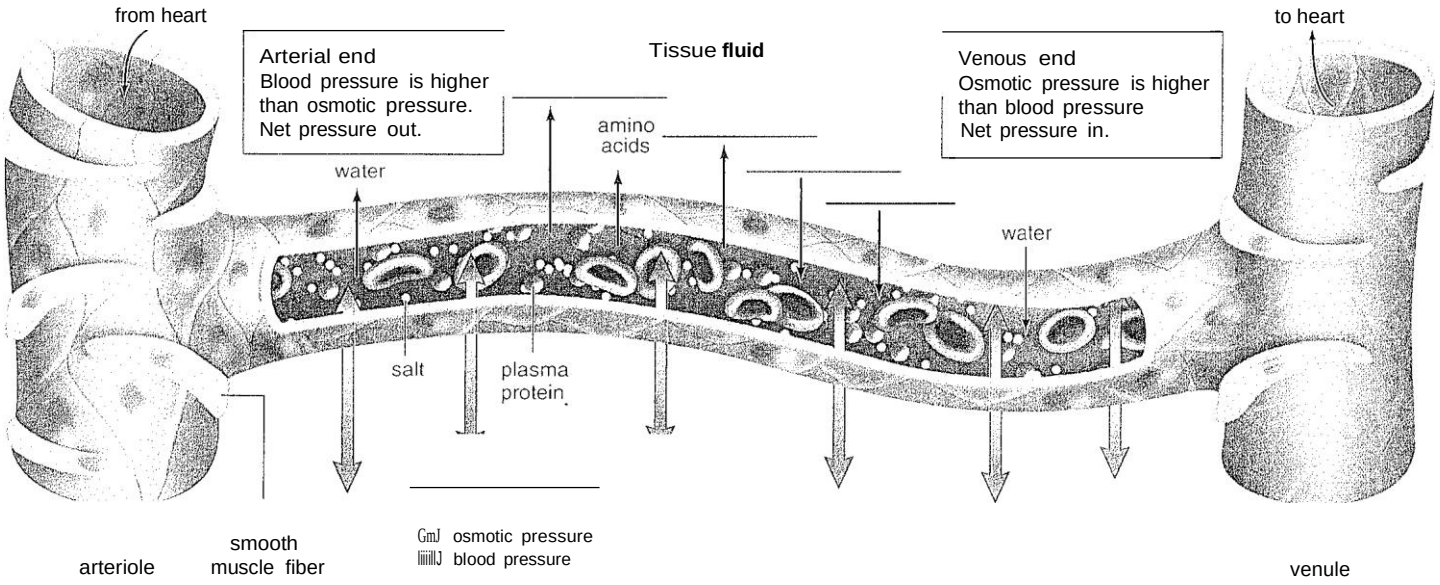
1. Observe blood flow through arterioles, capillaries, and venules, either in the tail of a goldfish or in the webbed skin between the toes of a frog, as prepared by your instructor.

2. Examine under low and high power ofthe microscope.
3. Watch the pulse and the swiftly moving blood in the arterioles.
4. Contrast this with the more slowly moving blood that circulates in the opposite direction in the venules. Many criss-crossing capillaries are visible.
5. Look for blood cells floating in the bloodstream. Don't confuse blood cells with chromatophores, irregular black patches of pigment that may be visible in the skin.

Systemic Capillary Exchange

The beat of the heart creates blood pressure, and blood pressure is necessary to capillary exchange. Blood pressure acts to move water out of a capiJlary, while osmotic pressure (created by the presence of proteins in the blood) acts to move water into a capillary (Fig. 16.5). Blood pressure is higher than osmotic pressure at the arteriole end of a capillary and water moves out of a capillary. But blood pressure lessens as the blood moves through a capillary bed. ll1is means that osmotic pressure is higher than blood pressure at the venule end of a capillary and water moves back into capillary.

Figure 16.5 Systemic capillary exchange.
At a systemic capillary, an exchange takes place across the capillary wall. Between the arterial end and the venule end, molecules follow their concentration gradient. Oxygen and nutrients move out of a capillary while carbon dioxide and wastes move into the capillary.



Conclusions: Systemic Capillary Exchange

" What generates blood pressure? _____

• Why are tissue cells always in need of glucose and mcygen? _____

Add glucose a.t th.e end ofan. appropriate arrow in Figure 16.5. Do the same for oxygen.

• Why are tissue cells always prodLtcing carbon dioxide? _____

Add carbon dioxide at the start of an appropriate arrow in Figure 16.5. Do the same for metabolic wastes.

16.3 lung Structure and Human Respiratory Volumes

The right and left lungs lie in the thoracic cavity on either side of the heart. Air moves from the nasal passages to the trachea, bronchi, bronchioles, and finally, lungs.

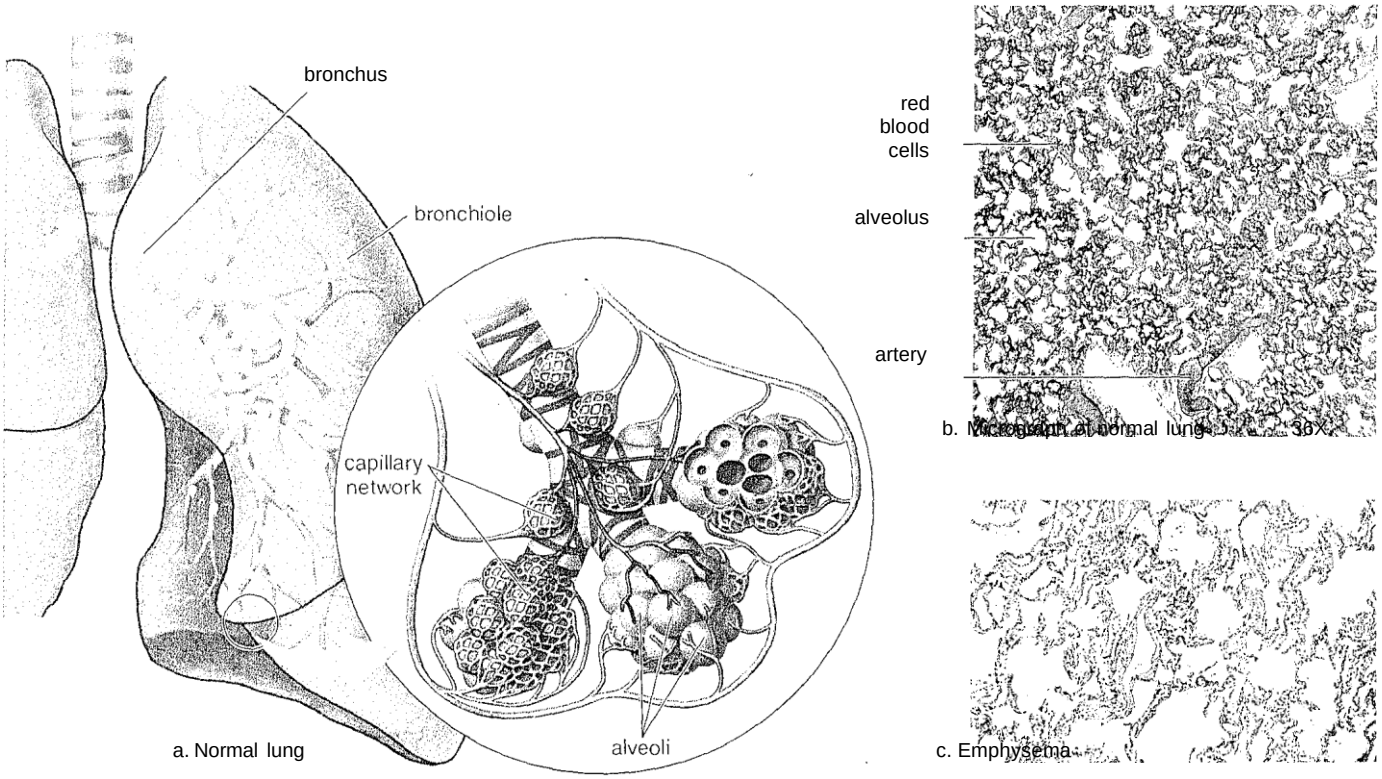
Lung Structure

A **lung** is a spongy organ consisting of irregularly shaped air spaces called **alveoli** (sing., alveolus) (Fig. l6.6a). The alveoli are surrounded by a rich network of tiny blood vessels called pulmonary capillaries. *In Fig. l6.6a, use a labeled arrow to show oxygen entering blood from an alveoli and another labeled arrow to show carbon dioxide entering alveoli from the blood.*

Observation: Lung Structure

1. Observe a prepared slide of a stained section of a lung (Fig. l6.6b}. In stained slides, the nuclei of the cells forming the thin alveolar walls appear purple or dark blue.
2. Look for areas that show red or orange disc-shaped erythrocytes. These are the red blood cells that contain hemoglobin which takes up oxygen and transports it to the tissues. When these appear in strings, you are looking at capillary vessels in side view.
3. ln some part ofthe slide, you may even observe an artery. 1l1icker, circular or oval structures witl1 a lumen (cavity) arc cross sections of bronchioles, tubular pathways through which air reaches the air spaces.
4. In Figure l6.6c, note that in emphysema, alveoli have burst. In smokers, small bronchioles coJlapse and trapped air in alveoli causes them to burst. Now gas exchange is minimal.

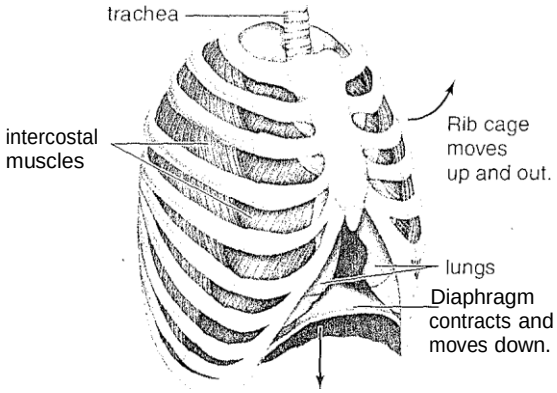
Figure 16.6 Healthy **lung** tissue versus emphysema.
a. The lungs normally contain many air sacs called alveoli where gas exchange occurs. b. Micrograph of normal lung tissue. c. In smoke1·s, emphysema can occur; the alveoli burst and gas exchange is inadequate.



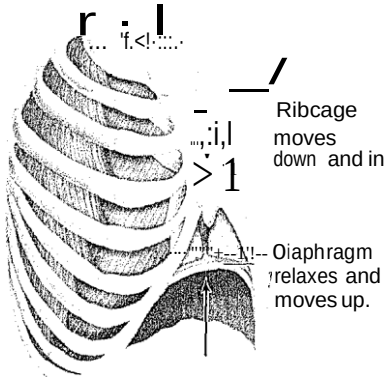
Human Respiratory Volumes

Breathing in, called inspiration or inhalation, is the active part of breathing because that's when contraction of rib cage n1uscles causes the rib cage to move up and out, and contraction of the diaphragm causes the diaphragm to lower. Due to an enlarged thoracic cavity, the lungs expand and air is drawn into them. Breathing out, called expiration or exhalation, occurs when relaxation ofthese same muscles causes the thoracic cavity to resume its original capacity. Now air is pushed out of the lungs (Fig. 16. 7}.

Figure 16.7 Inspiration and expiration.
a. Inspiration occurs after the rib cage moves up and out and the diaphragm moves down. Air rushes into lungs because they expand as the thoracic cavity expands. b. Expiration occurs as the rib cage moves down and in and the diaphragm moves up. As the thoracic cavity and lungs get smaller, air is pushed out.



a. Inspiration



b. Expiration

Experimental Procedure: Human Respiratory Volumes

During this Experimental Procedure you will be worldng with a spirometer, an instrument that measures the amount of exhaled air (Fig. 16.13). Normally, about 500-600 ml of air move into and out of the lungs with each breath. "l11is is caJled the tidal volume (TV). You can inhale deeply after a normal breath and more air will enter the lungs; this is the inspiratory reserve volume (IRV). You can also force more air out of your lungs after a normal breath; this is the expiratory reserve volume (ERV). Vita] capacity is the volume of air that can be forcibly exhaled after forcibly inhaling.

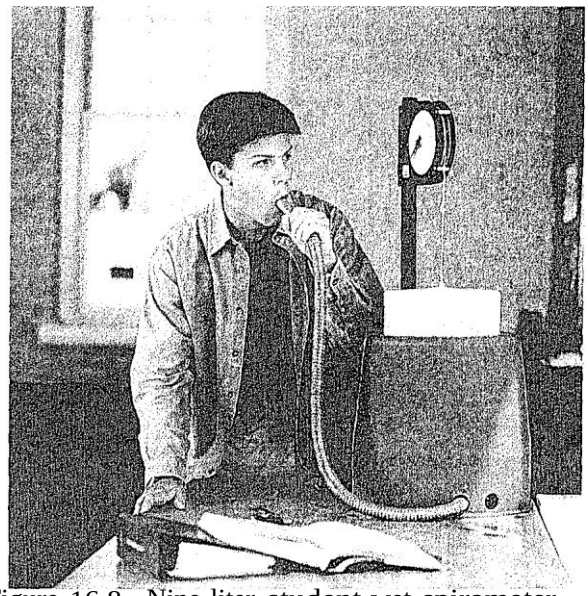


Figure 16.8 Nine-liter student wet spirometer.

Tidal Volume (TV)

1. When it's your turn to Llse tbe spirometer, install a new disposable mouthpiece and set the spirometer to zero.
2. Inhale normally, then exhale normally (with *no* extra effort) through the mouthpiece of the spirometer. H,ecord your .measurement in Table 16.2.
3. Three readings are needed, so twice more set the spirometer to zero and repeat the same procedure. Record your measurements in Table 16.2.
4. Later, if necessary, change your readings to milliliters (mJ), and calculate your average TV in mi.

In your own words, what is tidal volume?----------

Expiratory Reserve Volume (ERV)

1. Make sure the spirometer is set to zero.
2. Inhale and exhale normally and then force as much air out as possible into the spirometer. Hecord your measurement in Table 16.2.

3. Three readings are needed, so twice more, set the spirometer to zero and repeat the same procedure. Hecord your measurements in Table 16.2.
4. Later, if necessat·y, change your readings to ml, and calculate your average EHV

Ln your own words, what is expiratory reserve volume? _____

_____

Vital Capacity (VC)

1. Make sure the spirometer is set to zero.
2. Inhale as much as possible and then exhale as much as possible into the spirometer.
3. Three readings are needed, so twice more, set the spirometer to zero and repeat the same procedure. Hecorcl your measurements in 'fable 16.2.
4. Later, if necessary, change your readings to ml, and calculate your average VC.

In your own words, what is vital capacity? _____

_____

Inspiratory Reserve Volume (IRV)

It will be necessary for us to calculate LHV because a spirometer measures only exhaled air, not inhaled air.

Explain.----------·----

From having measured vital capacity (VC) you can see that VC = TV + IHV + ERV To calculate JEW, simply subtract the average 'rV + the average EHV from the value you recorded for the average VC:

IHV = VC- (TV+ ERV) = _____ml. Recore! your IRVin Table 16.2.

Table 16.2 Measurements of Lung Volumes

Tidal Volume (TV)	Expiratory Reserve Volume (ERV)	Vital Capacity (VC)	Inspiratory Reserve Volume (IRV)
lst	.l st	lst	
2ncl	2nd	2nd	
3rd	3rcl	3rd	
Average rnl	Average ml	Average ml	Calculatecl value = ml

Conclusions: Human Respiratory Volumes

Vital capacity varies with age, sex, and height; however, typically for men, vital capacity is about 5,200 ml and for women, it is about 4,000 ml. How does your vital capacity corn pare to the typical values for your gender? _____[f smaller than normal, are you a smoker or is there any health reason why it would be smaller? If larger than normal, are you a sports enthusiast or do you play a musical instrument that involves inhaling and exhaling deeply? _____

- Diffusion alone accounts for pulmonary gas exchange.]l1erefore, how does good lung ventilation assist gas exchange?_____

_____

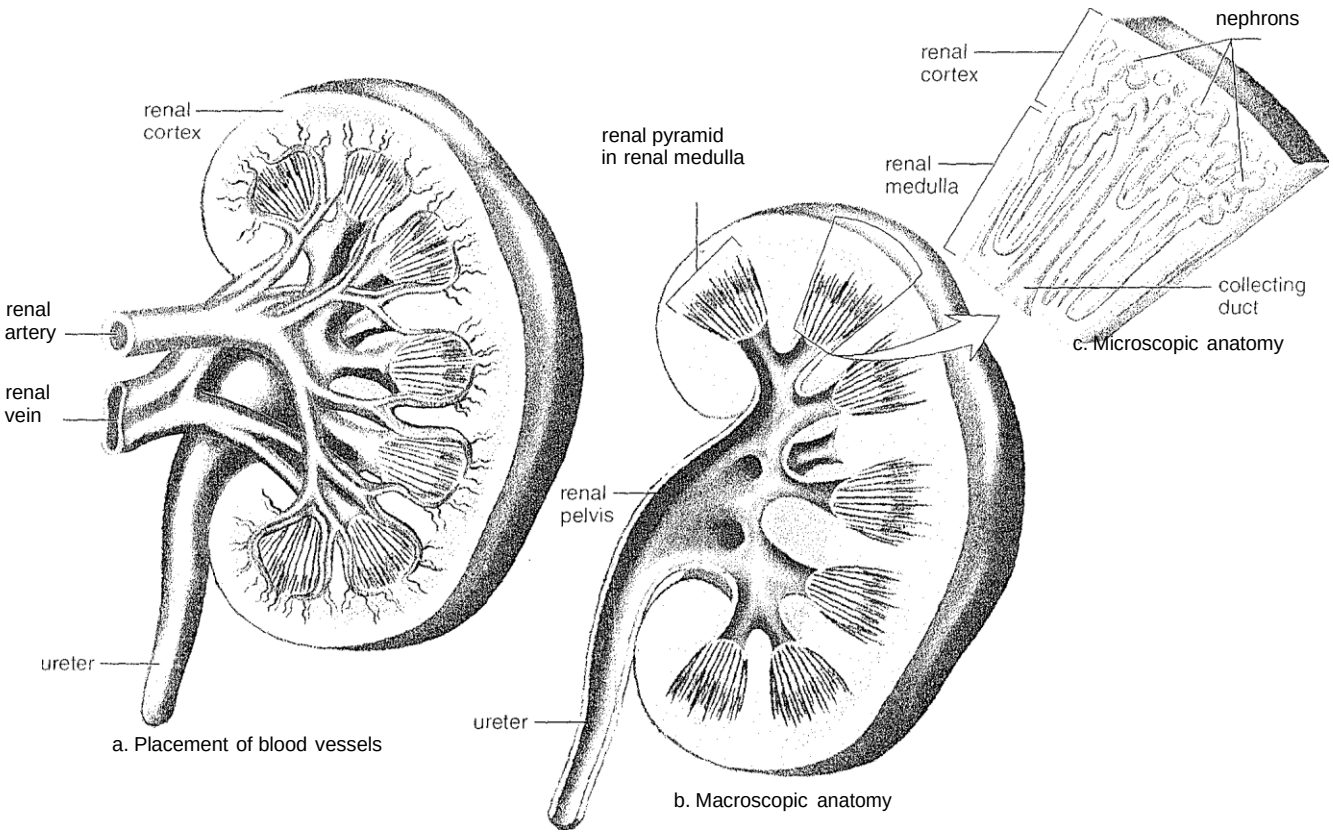
16.4 Kidneys

The kidneys are bean-shaped organs that lie along the dorsal wall of the abdominal cavity.

Kidney Structure

Figure 16.9 shows the structure of a kidney, macroscopic and microscopic. The macroscopic structure of a kidney is clue to the placement of over 1 million nephrons. Nephrons are tubules that do the work of producing urirw.

Figure 16.9 Longitudinal section of a kidney.
a. The kidneys are served by the renal artery and renal vein. b. Macroscopically, a kidney has three parts: renal cortex, renal medulla, and renal pelvis. c. Microscopically, each kidney contains over a million nepr1rons.



Observation: Kidney Model

Study a model of a kidney, and with the help of Figure 16.9, locate the following:

1. Renal cOt·tex: a granular region
2. Renal meduJJa: contains the renal pyramids
3. l{enai pelvis: where urine collects

Observation: Nephron Structure

Study a nephron model and, with the help of Figure 16.10, identify the following parts of a nephron:

1. Glomerular capsule: (Bowman's capsule): closed end ofthe nephron pushed in on itself to forrn a cuplike structure; the inner layer has pores that allow glomerular filtration to occur; substances move from the blood to inside the nephron.
2. Proximal convoluted tubule: "l11e inner layer of this region has many microvilli that allow tubular reabsorption to occur; substances move from inside the nephron to the blood.
3. Loop ofthe nephron: Nephron narrows to form aU-shaped portion which functions in water reabsorption.
4. Distal convoluted tubule: second convoluted section that lacks microvilli and functions in tubular secretion; substances move from blood to inside nephron.

Several nephrons enter one collecting duct. 111e collecting ducts also function in water reabsorption, and they conduct urine to the pelvis of a kidney.

Observation: Circulation About a *Nephron*

Study a nephron model and, with the help of Figure 16.10 and Table 16.3, trace the path of blood from the renal <lrtery to the renal vein:

1. Afferent arteriole: small vessel that conducts blood ti·orn the renal artery to a nephron.
2. Glomerulus: capillary network that exists inside the glomerular capsule; small molecules move from inside the capillary to the inside of the glomerulus during glomerular filtration.
3. Efferent arteriole: small vessel that conducts blood from the glomerulus to the peritubular capillary network.
4. Peritubular capillary network: surrounds the proximal convoluted tubule, the loop of the nephron, and the distal convoluted tubule.
5. Venule: takes blood from the peritubular capillary network to the renal vein.

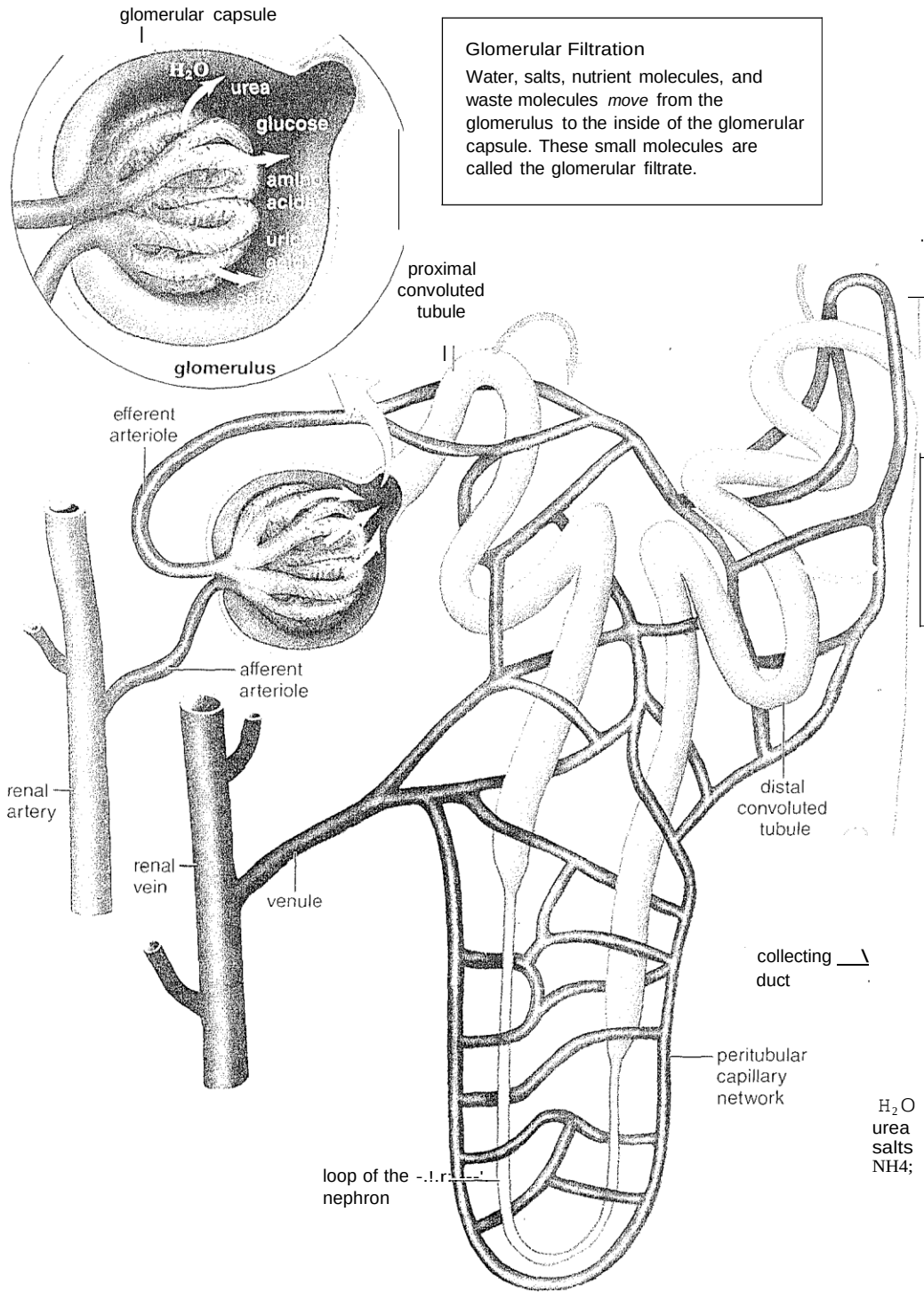
Table 16.3 Blood Vessels Serving the Nephron

Name of Structure	Significance
i\flcrent arterioJe	Brings arteriolar blood to the glomerulus
Glomerulus	Capillary tuft enveloped by glomerular capsule
Efferent arteriole	Takes arteriolar blood away from the glomerulus
Perit:ubularcapillary network	Capillary bed that envelops the rest of the nephron
Venule	Takes venous blood away from the peri tubular capillary network

Kidney Function

The kidneys produce urine and in doing so help maintain homeostasis in several ways. Urine formation requires three steps: glomerular filtration, tubular reabsorption, and tubular secretion (see Fig. 16.10).

Figure 16.10 Nephron structure and blood supply.
The three main processes in urine formation are described in boxes and color coded to arrows that show the movement of molecules out of or into the nephron at specific locations. In the end, urine is composed of the substances within the collecting duct (see brown arrow).



Glomerular Filtration
Water, salts, nutrient molecules, and waste molecules *move* from the glomerulus to the inside of the glomerular capsule. These small molecules are called the glomerular filtrate.

Tubular Reabsorption
NutH nt- _nq sal_t m31e2u.l s•.are• actively rea 9prbecj;from_th,e. convolute_dtubules i to t eperitub.ulcapjllaryn\'twork, and .w.at r,J191Ns p2t siv ly,

Tubular Secretion
Certain molecules (e.g., H' and penicillin) are actively secreted from the peritubular capillary network into the convoluted tubules.

--'--end of another distal tubule

Glomerular Filtration

1. Blood entering the glomerulus contains blood cells, proteins, glucose, amino acids, salts, urea, and water. Blood cells and proteins are too large to pass through the glomerular wall and enter the filtrate.
2. Blood pressure causes small molecules of glucose, amino acids, salts, urea, and water to exit the blood and enter the glomerular capsule. clbe fluid in the glomerular capsule is called the **filtrate.**
3. In the list that follows, draw an arrow from left to right for the small molecules that leave the glomerulus and become part ofthe filtrate.

Glomerulus	**Glomerular (Filtrate)**
Cells	
Proteins	
Ghtcose	
Amino acids	
Urea	
Water and salts	

4. Cornplete the second column in Table 16.4, p. 226. Use an X to indicate that the substance is at the locations noted.

Tubular Reabsorption

L When the filtrate enters the proximal convoluted tubule, it contains glucose, amino acids, urea, water, and salts. Some water and salts remain in the nephron, but enough are *passively* reabsorbed into the peritu bular capillary to maintain blood volume and blood pressure. Use this information to state a way kidneys help maintain homeostasis. _____

_____

2. The cells that line the proximal convoluted tubule are also engaged in active transport and usually completely reabsorb nutrients (glucose and amino acids) into the peritubular capillary. What would happen to cells if the body lost all its nutrients by way of the kidneys? _____

_____

3. Which of the filtrate substances is reabsorbed the least and will become a part of urine? _____

Urea is a nitrogenous waste. State here another way kidneys contribute to homeostasis. _____

_____

4. In the list that follows, draw an arrow from left to right for all those molecules passively reabsorbed into the blood of the peritubular capillary. Use darker arrows for those that are reabsorbed completely · by active transport.

Proximal Convoluted Tubule	**Peritubular Capillary**
Water and salts	
Glucose	
Amino acids	
Urea	

Tubular Secretion

1. During tubular secretion, certain substances-for example, penicillin and histamine-are actively secreted from the peritubular capillary into the fluid of the tubule. Also, hydrogen ions (H^+) and ammonia (NH_3) are *secreted* as NH_4^+ as necessary. Complete the last column of Table 16.4. Check your entries against Figure 16.10.
2. The blood is buffered, but only the kidneys can *excrete* H^+. The excretion of H^+ by the kidneys raises the pH of the blood. Use this information to state a third way *the* kidneys contribute to homeostasis. _____

Table 16.4 Urine Constituents

In Glomerulus	In Filtrate	In Urine
Blood cells		
Proteins		
Glucose		
Amino acids		
Urea		
Water and salts		
NH_3		

Urinalysis: A Diagnostic Tool

Urinalysis can indicate whether the kidneys are functioning properly or whether an illness such as diabetes mellitus is present. The procedure is easily performed with a Chemstrip test strip, which has indicator spots that produce specific color reactions when certain substances are present in urine.

Experimental Procedure: Urinalysis

A urinalysis has been ordered, and you *are* to test the urine for a possible illness. (In this laboratory, you will *be* testing simulated urine.)

Assemble Supplies

1. Obtain three Chemstrip urine test strips each of which tests for leukocytes, pH, protein, glucose, ketones, and blood, as noted in Figure 16.11.
2. The color key on the diagnostic color chart or on the Chemstrip vial label will explain what any color changes mean in terms of the pH level and amount of each substance present in the urine sample. You will use these color blocks to read the results of your test.
3. Obtain three "specimen containers of urine" marked 1 through 3. Among *them* are a normal specimen and two that indicate the patient has an illness. Have a piece of absorbent paper ready to use.

Test the Specimen

1. Briefly (no longer than 1 second) dip a test strip into the first specimen of urine. Be sure the chemically treated patches on the test strip are totally immersed.
2. Draw the edge of the strip along the rim of the specimen container to remove excess urine.
3. Turn the test strip on its side, and tap once on a piece of absorbent paper to remove any remaining urine and to prevent the possible mixing of chemicals.
4. After 60 seconds, read the results as follows: Hold the strip close to the color blocks on the diagnostic color chart (Fig. 16.11) or vial label, and match carefully, ensuring that the strip is properly oriented to the color chart. Enter the test results in Figure 16.11. Use a negative symbol (-) for items that are not present in the urine, a plus symbol (+) for those that are present, and a number for the pH.
5. Test the other two specimens.

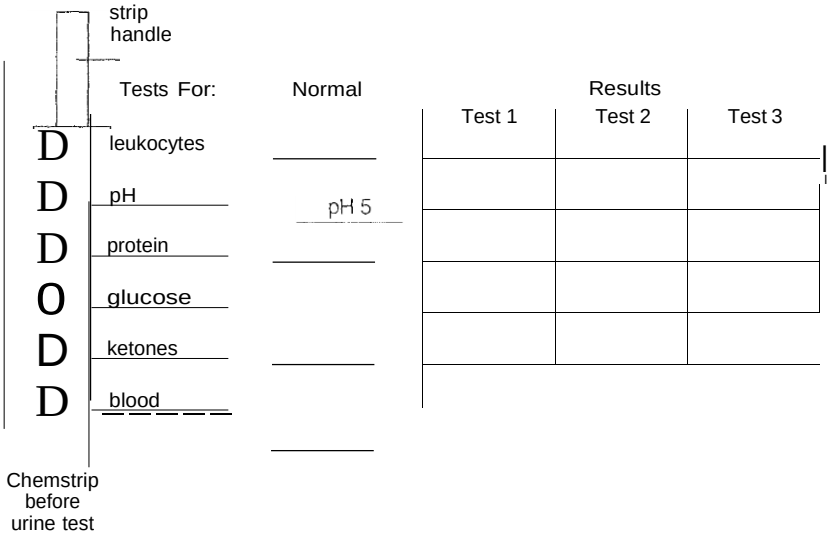


Figure 16.11 Urinalysis test.
A Chemstrip test strip can help determine illness in a patient by detecting substances in the urine. If leukocytes (white blood cells), protein, or blood are in the urine, the kidneys are not functioning properly. If glucose and ketones are in the urine, the patient has diabetes mellitus (type 1 or type 2).

Conclusion: Urinalysis

1. State below if the urinalysis is normal or indicates a urinary tract infection (leukocytes, blood, and possibly protein in the urine) or that the patient has diabetes mellitus.

   Test strip 1 _____

   Test strip 2 _____

   Test strip 3 _____

2. The hormone insulin promotes the uptake of glucose by cells. When glucose is in the urine, either the pancreas is not producing insulin (diabetes mellitus type 1) or cells are resistant to insulin (diabetes mellitus type 2). Ketones (acids) are also in the urine because the cells are metabolizing fat instead of glucose. Explain why. _____

   _____

   Why is the pH of urine lower than normal? _____

   _____

- If urinalysis shows that proteins are excreted instead of retained in the blood, would capillary exchange in the tissues (see Fig. 16.5) be normal? _____ Why or why not? _____

  _____

TEXARKANA COLLEGE

laboratory **Review** 16

1. Systole of what chamber causes a systemic blood pressure reading of 120?
2. Body cells receive their oxygen and nutrients byway of which type vessels?
3. The presence especially of proteins in the blood account for what pressure that draws water back into tbe systemic capillaries?
4. What blood vessel takes nutrients absorbed from the digestive system to the liver?
5. Emphysema due to smoking causes the _____of lung tissue to burst.
6. WJ1at is another name for erythrocytes tl1at transport oxygen in the blood?
7. When we exbale, the diaphragm relaxes and moves in what direction'?
8. When measuring tidal volume, should a student exhale normally or maximally?
9. Vital capacity is expected to have a (higher or lower) volume than tidal volume.
10. Where does urine collect before exiting the kidney?
11. When molecules leave the glomerular capsule, they enter what portion of a nephron?
12. Name the process by which molecules move from the proximal convoluted tubule into the blood.
13. Name a substance that is normally in the blood, the Jiltrate, and the urine.
14. Glucose in the urine indicates that a person may l1ave what condition?

Thought Questions

15. ln your own words, what is homeostasis?

16. We studied three ways the kidneys contribute to homeostasis. Name two ofthese.

17. How clo pulmonary capillaries contribute to homeostasis?

18. How does the heartbeat (i.e., cardiac contraction) contribute to homeostasis'?