

Bio 263 Lab Outline

Week	<p>Lab exercises correlate with lab manual (Martin, Terry. <i>Hole's Human Anatomy & Physiology Laboratory Manual</i>, 16th Ed. ISBN: 9781264262861)</p> <p>Lab time: 2 hours and 50 minutes</p> <p>Other: All labs are completed in a face-to-face format. All cadavers are pre-dissected. Highlighted labs represent physiology and specimen dissection.</p>
1	<p>Introduction</p> <ul style="list-style-type: none"> • Time Spent: 50 minutes • Methodology: Students will be introduced to the lab room, safety equipment, and cleaning techniques. Cadaver policies and proper handling will be discussed. <p>Lab Exercise #2: Body Organization & Terminology</p> <ul style="list-style-type: none"> • Time Spent: 80 mins • Organisms used: Model and human cadaver (head, torso, arm, and leg) • Methodology: Students will identify body regions, body cavities, and directional terms <p>Lab Exercise #4: Care & Use of the Microscope</p> <ul style="list-style-type: none"> • Time Spent: 20 mins • Tools used: Compound microscope • Methodology: Students will review parts of the microscope and their functions. They will also review proper use, cleaning techniques and storage. (Review from pre-requisite) <p>Lab Exercise #5: Cell Structure & Function {Take Home Activity – Review from Pre-req}</p> <ul style="list-style-type: none"> • Students will review and label cell structures, organelles, and cytoskeletal elements <p>Lab Exercise #7: Cell Cycle {Take Home Activity – Review from pre-requisite}</p> <ul style="list-style-type: none"> • Students will review and label whitefish cells undergoing stages of the cell cycle
2	<p>Lab Exercise #8: Epithelial Tissues</p> <ul style="list-style-type: none"> • Time Spent: 60 mins • Tools used: Compound microscope and slide box • Methodology: Students will identify various epithelial tissues and their components (i.e., cell types). They will use a compound microscope and prepared mammalian slides to examine and sketch the tissues in their lab manual. The instructor will guide the students while using an instructor scope with projection.

	<p>Lab Exercise #9: Connective Tissues</p> <ul style="list-style-type: none"> • Time Spent: 90 mins • Tools used: Compound microscope and slide box • Methodology: Students will identify various connective tissues and their components (i.e., cell types and cytoskeletal elements). They will use a compound microscope and prepared mammalian slides to examine and sketch the tissues in their lab manual. The instructor will guide the students while using an instructor scope with projection.
3	<p>Lab Exercise #9 Cont'd: Connective Tissues</p> <ul style="list-style-type: none"> • Time Spent: 60 mins • Tools used: Compound microscope and slide box • Methodology: Students will identify various connective tissues and their components (i.e., cell types and cytoskeletal elements). They will use a compound microscope and prepared mammalian slides to examine and sketch the tissues in their lab manual. The instructor will guide the students while using an instructor scope with projection. <p>Lab Exercise #10: Muscle & Nervous Tissues</p> <ul style="list-style-type: none"> • Time Spent: 50 mins • Tools used: Compound microscope and slide box • Methodology: Students will identify skeletal, cardiac, and smooth muscle and nervous tissues along with their components. They will use a compound microscope and prepared mammalian slides to examine and sketch the tissues in their lab manual. The instructor will guide the students while using an instructor scope with projection. <p>Lab Exercise #11: Integumentary System</p> <ul style="list-style-type: none"> • Time Spent: 50 mins • Organisms: Integumentary model and tissue slide • Tools used: Compound microscope and slide box • Methodology: Students will identify various components (i.e., hair follicle) of the epidermis, dermis, and hypodermis on an integumentary model and mammalian skin slide. They will use a compound microscope and prepared mammalian slides to examine and sketch the structures in their lab manual. The instructor will guide the students while using an instructor scope with projection.
4	<p>Lab Practical #1: Anatomical Terminology & Histology (tested on microscope, model & cadaver) (75 minutes)</p> <p>Lab Exercise #13: Organization of the Skeleton</p> <ul style="list-style-type: none"> • Time Spent: 35 mins • Organisms: Fully Articulated Skeleton (human and model) • Methodology: Students will identify the parts of the axial and appendicular skeleton

	<p>Lab Exercise #14: Skull</p> <ul style="list-style-type: none"> • Time Spent: 40 mins • Organisms: Human Skull articulated and disarticulated (human and model) • Methodology: Students will identify the cranial and facial bones using human and model skulls. They will also identify the various bone markings of those bones.
5	<p>Lab Exercise #14 Cont'd: Skull Time Spent: 75 mins Organisms: Human Skull articulated and disarticulated (human and model) Methodology: Students will identify the cranial and facial bones using human and model skulls. They will also identify the various bone markings of those bones</p> <p>Lab Exercise #15: Vertebral Column & Thoracic Cage</p> <ul style="list-style-type: none"> • Time Spent: 50 mins • Organisms: Human vertebral column (articulated and disarticulated), fully articulated skeleton, ribs, and sternum (human and model) • Methodology: Students will identify the bones of the vertebral column and thoracic cage using human bones and models. They will also identify the various bone markings of those bones. <p>Lab Exercise #16: Pectoral Girdle & Upper Limb</p> <ul style="list-style-type: none"> • Time Spent: 25 minutes • Organisms: Human and model upper extremity bones (clavicle, scapula, humerus, ulna, radius, hand) • Methodology: Students will identify the bones of the upper extremity and their bone markings.
6	<p>Lab Exercise #16 Cont'd: Pectoral Girdle & Upper Limb</p> <ul style="list-style-type: none"> • Time Spent: 75 minutes • Organisms: Human and model upper extremity bones (clavicle, scapula, humerus, ulna, radius, hand) • Methodology: Students will identify the bones of the upper extremity and their bone markings. <p>Lab Exercise #17: Pelvic Girdle & Lower Limb</p> <ul style="list-style-type: none"> • Time Spent: 75 minutes • Organisms: Human and model lower extremity bones (pelvis, femur, tibia, fibula, foot) • Methodology: Students will identify the bones of the lower extremity and their bone markings.

7	<p>Lab Practical #2: Axial & Appendicular Skeleton (tested on human and model bones)</p> <p>Lab Exercise #20: Head and neck muscles</p> <ul style="list-style-type: none"> • Time Spent: 75 minutes • Organisms: Model and human cadaver • Methodology: Students will identify the muscles and their actions of the head and neck.
8	<p>Lab Exercise #21-22: Chest, abdomen, and shoulder muscles (150 minutes) - model & human cadaver</p> <ul style="list-style-type: none"> • Time Spent: 150 minutes • Organisms: Model and human cadaver • Methodology: Students will identify the muscles and their actions of the chest, abdomen, and shoulder.
9	<p>Lab Exercise #22: Upper extremity muscles</p> <ul style="list-style-type: none"> • Time Spent: 90 minutes • Organisms: Model and human cadaver • Methodology: Students will identify the muscles and their actions of the upper extremity. <p>Lab Exercise #23: Lower extremity muscles</p> <ul style="list-style-type: none"> • Time Spent: 60 minutes • Organisms: Model and human cadaver • Methodology: Students will identify the muscles and their actions of the lower extremity
10	<p>Lab Exercise #23 Cont'd: Lower extremity muscles</p> <ul style="list-style-type: none"> • Time Spent: 60 minutes • Organisms: Models and human cadaver • Methodology: Students will identify the muscles and their actions of the lower extremity <p>Muscle Physiology:</p> <ul style="list-style-type: none"> • Time Spent: 90 minutes • Tools: Vernier dynamometer, EMG electrodes, GaPRO analysis Vernier program • Methodology: Following the physiology lab provided from vernier, students will gather data on muscle strength (grip force) using a dynamometer and various weights. The students will also observe EMG recordings based on force produced. Measurement of amplitude over time will be measured. The students will then observe changes in amplitude associated with muscle fatigue. Other responses will also be measured such as reinforcement.

11	<p>Lab Practical #3: Human Muscles (tested on human model & human cadaver) (75 minutes)</p> <p>Lab Exercise #26: Brain (model & cadaver)</p> <ul style="list-style-type: none"> • Time Spent: 75 minutes • Organisms: Models (brain, ventricle, meninges) and human cadaver • Methodology: Students will identify the parts of the brain on a human model and a human brain. Human brains are extracted from the cadaver and sagittally cut for a 360° view.
12	<p>Lab Exercise #27: Dissection of the Sheep Brain</p> <ul style="list-style-type: none"> • Time Spent: 75 minutes • Organisms: Sheep brain with meninges • Methodology: Students will complete a dissection of a sheep brain. They will remove the meninges and perform a sagittal cut to identify the structures. <p>Lab Exercise #28: Spinal cord (model & cadaver)</p> <ul style="list-style-type: none"> • Time Spent: 75 minutes • Organisms: Spinal cord (model & cadaver) • Methodology: Students will participate in identification of structures on a human spinal cord (cadaver) and spinal cord model. Spinal cords were extracted from a cadaver and donated to MCC.
13	<p>Peripheral Nervous System</p> <ul style="list-style-type: none"> • Time Spent: 75 minutes • Organisms: Model and human cadaver • Methodology: Students will participate in identification of nerves (i.e., femoral, radial, sciatic) on a human cadaver and peripheral nerve model. <p>Lab Exercise #34: Eye Anatomy (model) and sheep eye dissection</p> <ul style="list-style-type: none"> • Time Spent: 75 minutes • Organisms: Model and cow eye • Methodology: Students will participate in identification of structures on a human eye model. Students will then complete a dissection of a cow eye and identify the structures.
14	<p>Lab Exercise #32: Ear Anatomy</p> <ul style="list-style-type: none"> • Time Spent: 75 minutes • Organisms: Model • Methodology: Students will participate in identification of structures on a human ear model. <p>Special Senses Activity (Physiology)</p> <ul style="list-style-type: none"> • Time Spent: 75 minutes • Tools: Reflex hammer, Snellen chart, ruler (near point), astigmatism wheel, Ishihara color vision test, ophthalmoscope, tuning fork, pennies (3)

	<ul style="list-style-type: none">• Methodology: Students will move through stations to perform various clinical testing of the nervous system. This includes the testing of reflexes, near point, visual acuity, color blindness, astigmatism, adaptation of receptors, conduction of hearing and retinal structures. Each station will provide a description of the physiological process associated with the testing.
15	<u>Lab Practical #4: CNS, PNS and Special Senses (tested on model & cadaver) (75 minutes)</u>

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1	<p>Introduction</p> <ul style="list-style-type: none"> • Time Spent: 30 minutes • Methodology: Students will be introduced to the lab room, safety equipment, and cleaning techniques. Cadaver policies and proper handling will be discussed. <p>Lab Exercise #37: Blood Cells (Histology) and Blood Typing</p> <ul style="list-style-type: none"> • Time Spent: 120 mins • Tools/Specimens: blood specimen (student), compound microscope, microscope slides & cover slips, Wright's stain, prepared blood smear slides, Carolina blood typing kit • Methodology: Students will use a compound microscope to examine blood histology using prepared blood smear slides and sketch examples of each cell type. They will also create a blood smear (Wright's stain) using their own blood and use it to perform of differential white blood cell count. And finally, students will type their own blood (ABO & Rh factor) using the <i>Carolina</i> agglutination assay.
2	<p>Lab Exercise #38: Heart Structure (Models, Cadavers, & Specimen Dissection)</p> <ul style="list-style-type: none"> • Time Spent: 110 mins • Tools/Specimens: heart models, mammalian hearts, dissection trays and instruments, human cadaver hearts • Methodology: Students will participate in a review of heart anatomy using anatomical models and prosected human cadaver hearts. They will then perform a dissection of a mammalian heart specimen (sheep). During the dissection, students will examine the external anatomy of the heart and attached vessels before opening the heart's chambers to locate internal structures. <p>Lab Exercise #39: Cardiac Cycle</p> <ul style="list-style-type: none"> • Time Spent: 40 mins • Tools: stethoscope, Vernier ECG sensor • Methodology: Students will auscultate heart sounds using a stethoscope and associate those sounds with the opening and closing of AV and SL valves during the cardiac cycle. Students will also work in groups using a Vernier ECG sensor to obtain and interpret an ECG recording.

3	<p>Lab Exercise #40: Blood Vessel Structure (Histology) & Arterial System (Models & Cadavers)</p> <ul style="list-style-type: none"> • Time Spent: 150 mins • Tools/Specimens: compound microscope, prepared slides, circulatory board models, human cadavers • Methodology: Students will begin the lab by using a compound microscope to examine/compare the structures of arteries and veins using prepared slides and sketching each vessel's histology. They will then participate in a review of arterial system anatomy using anatomical models. They will conclude with a detailed examination of the arterial system using prosected human cadavers.
4	<p>Lab Exercise #40 Cont'd: Venous System (Models & Cadavers)</p> <ul style="list-style-type: none"> • Time Spent: 100 mins • Tools/Specimens: circulatory board models, human cadavers • Methodology: Students will participate in a review of venous system anatomy using anatomical models. They will then perform a detailed examination of the venous system using prosected human cadavers. <p>Lab Exercise #41: Pulse Rate and Blood Pressure</p> <ul style="list-style-type: none"> • Time Spent: 50 mins • Tools: stethoscope, sphygmomanometer, stopwatch or clock • Methodology: Students will work in teams of two to examine pulse at the radial pulse point, manually measure arterial blood pressure, and test the effects of various factors (i.e., body position, exercise) on pulse and blood pressure.
5	<p>Lab Practical #1: Cardiovascular System (tested on prepared slides, anatomical models, mammalian heart specimen, human cadavers, and the procedures/interpretation of both blood typing and ECG) (75 minutes)</p> <p>Lab Exercise #42: Lymphatic System (Models, Cadavers, & Histology)</p> <ul style="list-style-type: none"> • Time Spent: 75 mins • Tools: anatomical models, human cadavers, compound microscope, prepared slides • Methodology: Students will participate in a review of lymphatic system anatomy using a variety of anatomical models and diagrams. They will then examine several structures of the lymphatic system using prosected human cadavers. Additionally, students will use a compound microscope to study and sketch the histology of a lymph node, the spleen, and the thymus using prepared slides.

6	<p>Lab Exercise #45: Respiratory Organs (Models, Cadavers, & Histology)</p> <ul style="list-style-type: none"> • Time Spent: 105 minutes • Tools/Specimens: anatomical models, human cadavers, compound microscope, prepared slides • Methodology: Students will participate in a review of respiratory anatomy using multiple anatomical models, including a sectioned head model and two respiratory board models. They will then perform a detailed examination of respiratory anatomy using prosected human cadavers. The heads and necks of some cadavers will be midsagittally sectioned to reveal internal structures. Students will also use a compound microscope to examine and sketch the histology of the trachea and lungs using prepared slides. <p>Lab Exercise #46: Breathing and Respiratory Volumes</p> <ul style="list-style-type: none"> • Time Spent: 45 minutes • Tools: lung function models, handheld spirometers • Methodology: Students will use the mechanical lung function models to observe the relationship between volume, pressure, and airflow. They will also use handheld spirometers to measure respiratory volumes. They will then calculate their respiratory capacities and minute ventilation and analyze their respiratory function using reference values.
7	<p>Lab Practical #2: Lymphatic and Respiratory Systems (tested on anatomical models, human cadavers, prepared slides, and respiratory volumes & capacities) (75 minutes)</p> <p>Lab Exercise #43: Digestive Organs (Models)</p> <ul style="list-style-type: none"> • Time Spent: 75 minutes • Tools: anatomical models • Methodology: Students will participate in a review of digestive system anatomy using a variety of anatomical models that depict both the gross and microscopic anatomy of the alimentary canal, accessory glands, and the biliary tract.
8	<p>Lab Exercise #43 Cont'd: Digestive Organs (Cadavers & Histology)</p> <ul style="list-style-type: none"> • Time Spent: 150 minutes • Tools/Specimens: human cadavers, compound microscope, prepared slides • Methodology: Students will participate in a detailed examination of digestive system anatomy using prosected human cadavers. They will also use a compound microscope to examine and sketch the histology of the alimentary canal and the accessory glands of the digestive system using prepared slides. The histology examination will include the esophagus, stomach, duodenum, jejunum, ileum, colon, liver, pancreas, and three salivary glands.

9	<p>Adaptation of Lab Exercise #44: Digestive Physiology</p> <ul style="list-style-type: none"> • Time Spent: 150 minutes • Tools: glassware, water baths, reagents, indicators • Methodology: Students will work in teams to study the activity of four digestive enzymes (amylase, pepsin, trypsin, and lipase). Students will conduct four experiments, one for each enzyme, which compare experimental conditions with controls to measure the effects of temperature, pH, and/or bile salts on the rate of enzyme activity. Students will then explain their observations in the context of human physiology.
10	<p>Lab Practical #3: Digestive System (tested on anatomical models, human cadavers, prepared slides, and the procedures/interpretation of the digestive physiology lab) (75 minutes)</p> <p>Lab Exercise #48: Urinary Organs (Models)</p> <ul style="list-style-type: none"> • Time Spent: 75 minutes • Tools: anatomical models • Methodology: Students will participate in a review of urinary system anatomy using a variety of anatomical models that depict both the gross and microscopic anatomy of the urinary system.
11	<p>Lab Exercise #48 Cont'd: Urinary Organs (Cadaver, Specimen Dissection, & Histology)</p> <ul style="list-style-type: none"> • Time Spent: 150 minutes • Tools/Specimens: human cadavers, mammalian kidney, dissection trays and instruments, compound microscope, prepared slides • Methodology: Students will participate in a detailed examination of urinary system anatomy using prosected human cadavers. Cadaver kidneys will be examined both intact within the abdominal cavity and extracted and coronally sectioned to reveal internal anatomy. Students will also complete a dissection of a mammalian kidney (pig). They will examine the external anatomy of the kidney and then perform a coronal section to locate internal structures. Additionally, students will use a compound microscope to examine and sketch the histology of the kidney and ureter.
12	<p>Lab Exercise #49: Urinalysis</p> <ul style="list-style-type: none"> • Time Spent: 75 minutes • Tools/Specimens: urine specimen (student), disposable urine-collection cups, urinometer cylinder & hydrometer, laboratory thermometer, reagent strips (combination, Uriscan), centrifuge, 15 mL conical tubes, compound microscope, microscope slides & cover slips, Sedi-stain • Methodology: Students will perform a physical and chemical examination of their own urine specimen. Students will begin with a macroscopic examination of color, odor, transparency, and specific gravity (using urinometer). They will then perform a chemical analysis using combination reagent strips to test for pH, specific gravity (confirmation of urinometer

	<p>results), glucose, protein, ketones, bilirubin/urobilinogen, hemoglobin/occult blood, nitrite, and leukocytes. And finally, they will create and stain a urine sediment slide and examine it using the compound microscope. Students will sketch and identify various sediments from their specimen, including cells, casts, and crystals.</p> <p>Lab Exercise #36: Endocrine Organs (Models, Cadavers, & Histology)</p> <ul style="list-style-type: none"> • Time Spent: 75 minutes • Tools/Specimens: anatomical models, human cadavers, compound microscope, prepared slides • Methodology: Students will participate in a review of endocrine system anatomy using several anatomical models. They will then perform an examination of endocrine anatomy using prosected human cadavers. They will also use a compound microscope to examine and sketch the histology of the using prepared slides. Endocrine glands studied will include the adrenal gland, thyroid gland, parathyroid gland, and pituitary gland.
13	<p>Lab Exercise #50: Male Reproductive Organs (Models, Cadavers, & Histology)</p> <ul style="list-style-type: none"> • Time Spent: 150 minutes • Tools/Specimens: anatomical models, human cadavers, compound microscope, prepared slides • Methodology: Students will participate in a review of male reproductive anatomy using several anatomical models. They will then perform a detailed examination of male reproductive anatomy using prosected human cadavers. Cadavers will be hemisected (midsagittal section) to provide a clear view of the pelvic organs. Externally, the penis will be midsagittally sectioned to reveal internal structures and the scrotum will be opened to clearly review the testis, epididymis, vas deferens, and vasculature. Students will also use a compound microscope to examine and sketch the histology of the testis, epididymis, and penis using prepared slides.
14	<p>Lab Exercise #51: Female Reproductive Organs (Models, Cadavers, & Histology)</p> <ul style="list-style-type: none"> • Time Spent: 150 minutes • Tools/Specimens: anatomical models, human cadavers, compound microscope, prepared slides • Methodology: Students will participate in a review of female reproductive anatomy using several anatomical models. They will then perform a detailed examination of female reproductive anatomy using prosected human cadavers. Cadavers will be hemisected (midsagittal section) to provide a clear view of the pelvic organs. Students will also use a compound microscope to examine and sketch the histology of the ovary, uterine tube, and uterus using prepared slides.
15	<p>Lab Practical #4: Urinary, Endocrine, & Reproductive Systems (tested on anatomical models, mammalian kidney specimen, human cadavers, prepared slides, and the procedures/interpretation of urinalysis) (75 minutes)</p>

