**Signature Anatomy and Physiology Labs Used by Colleges and Universities**

**RIGOROUS HANDS-ON LAB EXPERIMENTATION ANYTIME, ANYWHERE**

- Engaging laboratory learning experiences based on modern pedagogies.
- Educational background information that fully prepares students for completing the labs.
- Clearly defined procedures, mirroring on-campus laboratory coursework.
- Comprehensive assessments bring meaning to experiment results and build critical thinking skills.

**Choose One of Our Signature Anatomy & Physiology Lab Kits Below or Configure Your Own From Our Library of 31 Experiments**

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**A&P 1: Includes a large fetal pig for dissection experiments. Pigs included with A&P 1 are reutilized in A&P 2. A&P 1 includes instructions on maintaining preserved specimens for continued use.**
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| Cell Membranes and Transport in A&P   |                               | • Investigate the diffusion of starch and glucose across a semipermeable membrane using dialysis tubing, Benedict's reagent, and IKI.  
• Measure the effects of osmosis on chicken eggs.  
• Prepare blood smears and observe the effects of fluid tonicity on living cells using the prepared smears or provided digital images. |
| Genetics and Genomics                 |                               | • Create Punnett squares for genetic scenarios including color blindness, cystic fibrosis, Tay-Sachs disease, and Huntington's disease.  
• Interpret a series of pedigree charts and describe inheritance of hemophilia.  
• Read 4 karyotypes, diagnose genetic abnormalities, and describe phenotypes and genotypes. |
| Microscopy: Use and Function          |                               | • Label the components of a microscope and describe their function.  
• In the microscope lab version, students will. Measure and calculate fields of view.  
• Use the microscope and a digital camera to observe and photograph tissue from prepared slides.  
• In the digital lab version: Students will view digital images of amoeba, Spirogyra, and tonsils.  
• Prepare a wet-mount of epithelial cells and practice staining techniques. |
| Nutrition and Metabolism              |                               | • Apply the Harris-Benedict equation to calculate resting daily energy expenditure and total daily energy expenditure.  
• Log food intake for 24 hours and create a flowchart to illustrate food breakdown.  
• Calculate consumption of calories, carbohydrates, protein, fats, vitamins, and minerals. |
| Overview of Anatomy                   |                               | • Locate and classify 15 general body areas (i.e. caudal) and 46 body regions (i.e. femoral) using anatomical terminology.  
• Create a clay human model and slice the model through 3 planar sections.  
• Identify 11 organ systems, list the organs in each system, and describe their functions. |
| Water, Electrolytes, and Acid-Base Balance |                               | • Measure and compare the pH of various bodily fluids.  
• Perform a neutralization reaction with stomach acid (HCl) and an antacid.  
• Conduct a controlled experiment to investigate how buffers function.  
• Research the functions of electrolytes in the human body. |
| **Histology Experiment**              |                               |                            |
| Histology                             |                               | • Identify composition and function of epithelial, connective, muscular, and nervous tissues.  
• Examine and describe the cellular structures of 13 tissues. |
| **Muscular System Experiments**       |                               |                            |
| Organization of Muscle Tissue         |                               | • Examine the histology of skeletal, smooth, and cardiac muscles.  
• Model the origin, insertion, and movement of the pectoralis and biceps brachii muscles with rubber bands and a human skeleton model.  
• Dissect the superficial and deep thoracic muscles of a fetal pig. (This activity available with optional fetal pig purchase.) |
| Gross Anatomy of the Muscular System  |                               | • Describe and locate 9 muscles of the head and neck, 26 muscles of the torso and upper body, and 21 muscles of the lower body.  
• Use a human skeleton model and clay to construct muscles including origins and insertions.  
• Dissect superficial and deep muscles on a fetal pig in the following areas: cervical region, mediobiad and lateral forelimb, upper thoracic region, abdominal region and intercostals, and the medial and lateral hind limb. (This activity available with optional fetal pig purchase.) |
| Muscle Physiology                     |                               | • View EMGs (electromyographies) of coactivation and describe agonist and antagonist contractions, muscle twitch, and summation responses.  
• Perform forearm exercises and measure fatigue.  
• Perform maximal vertical jump tests and compare results between stretch-shortening and non-stretch shortening cycles. |
| **Skeletal System Experiments**       |                               |                            |
| Overview of the Skeletal System       |                               | • Use a human skeleton model to identify 33 bones, and describe the shape, function, and articulation/association of each bone.  
• Describe microscopic structures of ground compact bone, hyaline cartilage, elastic cartilage, and fibrocartilage. |
| Axial and Appendicular Skeleton       |                               | • Use a human skeleton model to identify 74 bones including 29 bones of the skull, 7 vertebrae and segments of the vertebral column, 5 types of thoracic bones, 5 bones of the upper limbs, 11 bones of the hand/wrist, 7 bones of the lower limbs, and 10 bones of the ankle/foot.  
• Observe and describe surface markings of 15 bones. |
| Joints and Body Movements             |                               | • Identify joints on a human skeleton model and palpate joints on the human body.  
• Investigate complex movements on a living subject, and describe body planes and how joints operate synergistically.  
• Dissect a chicken wing to observe joints, tendons, muscles, and movement. |

= Option to add a fetal pig dissection.  
= Option to use a microscope with prepared slides or choose digital images.
# ANATOMY AND PHYSIOLOGY

## Nervous System Experiments

### Gross Anatomy of the Central Nervous System
- Model the human brain with clay and describe structures and functions.
- Name, classify, and describe 12 cranial nerves and each of the major spinal nerves.
- Dissect a sheep brain and identify 30 structures.

### Organization of Nervous Tissue
- Examine the histology of a spinal cord cross section and a neuromuscular junction.
- Create physical models of nerves of the brachial plexus and sacral plexus on a human skeleton model.
- Dissect the brachial and sacral plexuses and identify major nerves. (This activity available with optional fetal pig purchase.)

### Reflex and Sensory Physiology
- Perform a controlled experiment of the association of taste and smell.
- Use a tuning fork to perform Weber Rinne tests; investigate sensorineural hearing, conductive hearing, and balance.
- Perform a vision test for blind spots and view an afterimage.
- Test the patellar reflex of a volunteer.
- Dissect a cow eye and identify major structures.

## Lymphatic and Endocrine System Experiments

### Lymphatic System
- Examine the histology of lymphatic structures, including the lymph node, thymus, spleen, and palatine tonsil.
- Identify the location of 8 major lymph nodes and organs on a human skeleton model.
- Conduct an experiment modeling antigen and antibody response using sera and an agar plate; identify an unknown serum using known anti-sera.

### Endocrine System
- Examine the histology of endocrine structures, including the adrenal gland, thyroid gland, pancreas, pituitary gland, ovary, and testis.
- Describe the function of 15 hormones and identify points of release, effects, and targets.

## Respiratory System Experiments

### Anatomy of the Respiratory System
- Examine the histology of lung and trachea tissue.
- Dissect the major respiratory structures, including the trachea, heart, and lungs of a fetal pig.

### Respiratory Physiology
- Construct a simple respirometer.
- Measure and calculate tidal volume, minute ventilation, and forced vital capacity on a human subject during exercise and while at rest.
- Examine the histogram of lung and trachea tissue.
- Construct a simple respirometer.
- Measure and calculate tidal volume, minute ventilation, and forced vital capacity on a human subject during exercise and while at rest.
- Dissect the major respiratory structures, including the trachea, heart, and lungs. (This activity available with optional fetal pig purchase.)

### Cardiovascular System Experiments

### Cardiovascular System: Blood
- Collect a blood sample and prepare a blood smear with Wright's stain and a blank slide.
- Identify erythrocytes, leukocytes, and platelets in the prepared blood smear or in provided digital images.
- Perform a blood typing test using anti-A, anti-B, and anti-D (Rh) sera.

### Cardiovascular Physiology
- Measure radial, brachial, and carotid pulses while seated, standing, during rest, and after exercise.
- Measure blood pressure during rest and after exercise.
- Interpret a series of normal and abnormal sinus rhythms in ECG readings.

### Cardiovascular System: Heart
- Examine the histology of cardiac cells and label intercalated discs and nuclei.
- Digitally label 15 major anatomical structures on a diagram of the heart.
- Dissect a sheep heart and identify external and internal structures.

### Cardiovascular System: Blood Vessels
- Examine and compare the histology of artery and vein cross sections.
- Dissect the major arteries and veins of the cervical and thoracic regions of a fetal pig.

### Cardiovascular System: Heart & Blood Vessels
- Examine the histology of cardiac cells and label intercalated discs and nuclei; examine and compare the histology of artery and vein cross sections.
- Digitally label 15 major anatomical structures on a diagram of the heart.
- Dissect a sheep heart and identify external and internal structures.
- Dissect the major arteries and veins of the cervical and thoracic regions of a fetal pig. (This activity available with optional fetal pig purchase.)

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Option to add a fetal pig dissection.

Option to use a microscope with prepared slides or choose digital images.
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| **Digestive System Experiments**   |                               | • Examine the histology of digestive tissues, including the stomach, duodenum, pancreas, and large and small intestines.  
• Perform chemical tests to model the breakdown of carbohydrates, proteins, and lipids during digestion.  
• Dissect features associated with digestion, including the mouth, salivary glands, and abdominal organs of a fetal pig. (This activity available with optional fetal pig purchase.) |
| **Digestive System**               | ✌️                             | Fetal pig Available                                                                                                                                                                                                                                                                                                                                                         |
| **Urinary System Experiments**     |                               | • Examine the histology of kidney and bladder tissue.  
• Dissect a sheep kidney, identify 8 structures, and describe the urine pathway.  
• Dissect the major structures of the urinary system, including the kidneys, bladder, ureters, and renal artery and vein of a fetal pig.                                                                                                                                                   |
| **Anatomy of the Urinary System**  | ✌️                             | Required                                                                                                                                                                                                                                                                                                                                                                   |
| **Urinalysis**                     | ✌️                             | • Test and analyze a urine sample; investigate parameters, including glucose, protein, nitrites and leukocytes, ketone, urobilinogen, bilirubin, and blood.  
• Determine the specific gravity and the pH of the urine.  
• Test the effects of hydration on urine composition.                                                                                                                                                                                                                                            |
| **Urinary System**                 | ✌️                             | Fetal pig Required                                                                                                                                                                                                                                                                                                                                                         |
| **Reproductive System Experiments**|                               | • Examine the histology of the ovary and testis.  
• Dissect the reproductive organs of a fetal pig.                                                                                                                                                                                                                                                                                                                           |
| **Reproductive System**            | ✌️                             | Required                                                                                                                                                                                                                                                                                                                                                                   |

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