BIOL 214
LAB HANDOUTS

You are responsible for all of the information contained within these handouts. Lab practicals will be directly related to the terms and concepts outlined in this document. You are encouraged to bring these handouts with you to each lab to ensure that you fully understand the material. Remember, spelling counts on lab practicals, so be sure to practice spelling anatomical terms.

BLOOD

Identify the following cells using microscope slides and pictures. Identify whether a leukocyte is categorized as granulocyte or agranulocyte and know basic functions. Complete the blood typing lab and be able to explain the relevance of the terms listed. Also be able to correctly match donor/recipients and identify blood type based on experimental results.

FORMED ELEMENTS:

Erythrocytes
Thrombocytes
Leukocytes
- Granulocytes
  - Neutrophils
  - Eosinophils
  - Basophils
- Agranulocytes
  - Monocytes
  - Lymphocytes

BLOOD TYPING:

Antigen
Antibody
Agglutination
Serum
ABO blood group
Rh blood group

CARDIOVASCULAR SYSTEM

Identify the following structures using models and pictures. Indicate left and right sides when appropriate and trace blood flow through the heart. Keep in mind that red and blue colors on the models indicate oxygenation and don't always correspond to artery/vein (for example, pulmonary arteries and veins).

HEART MODEL:

Coverings:
- Fibrous pericardium
- Parietal pericardium
- Visceral pericardium (epicardium)

Chambers:
- Right atrium
- Left atrium
- Right ventricle
- Left ventricle

Vessels:
- Superior vena cava
- Inferior vena cava
- Aorta
- Pulmonary trunk
- Left pulmonary artery
- Right pulmonary artery
- Left pulmonary veins
- Right pulmonary veins
- Right coronary artery
  (in coronary sulcus)
- Right marginal artery
- Posterior interventricular artery
  (in posterior interventricular sulcus)
- Left coronary artery
  (in coronary sulcus)
- Circumflex artery
  (in coronary sulcus)
- Anterior interventricular artery
  (in anterior interventricular sulcus)
- Great cardiac vein
- Middle cardiac vein
- Small cardiac vein
- Coronary sinus
  (in coronary sulcus)

Atrioventricular valves:
- Tricuspid valve
- Bicuspid valve

Semilunar valves:
- Pulmonary valve
- Aortic valve

Base

Apex

Chordae tendineae

Papillary muscles

Interventricular septum

Right auricle

Left auricle

CARDIOVASCULAR SYSTEM

Complete the iWorx ECG lab.

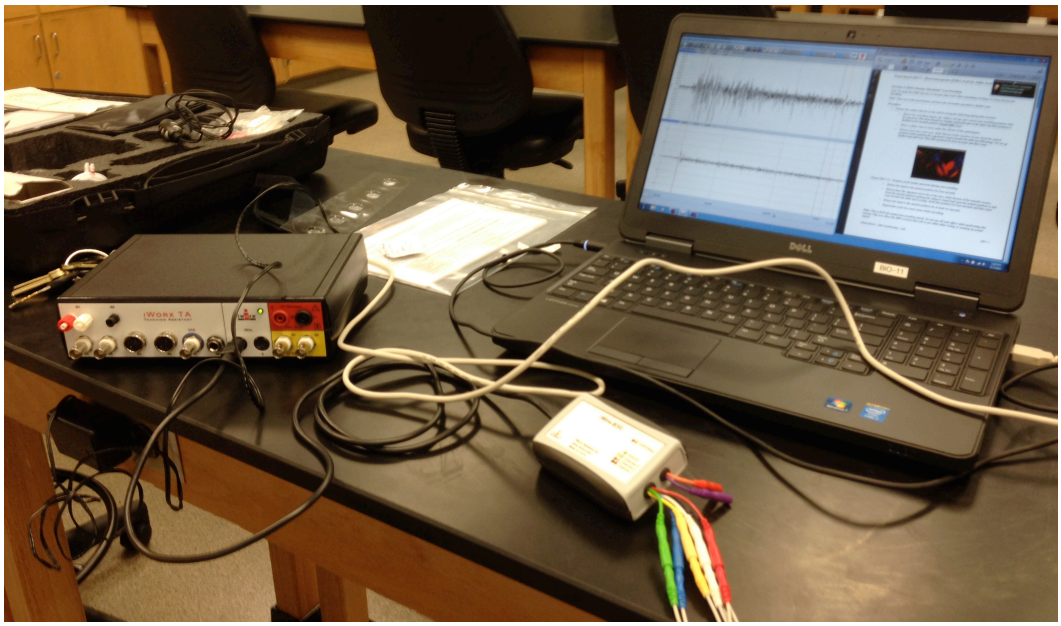
I. INTRODUCTION

A. **Electrocardiograms (ECGs)** are recordings of the electrical activity in the heart and can be used to detect abnormal patterns associated with heart disease.

B. In this lab, ECG recordings will be made at rest and after exercise in order to compare changes in the heart.

II. EQUIPMENT SET-UP

A. Connect the IXTA to the laptop using the USB cord. Also, connect this device to an electrical outlet using the power supply cord and turn on the power switch (verify that the light is green). Connect the ECG unit (with the multiple colored wires) into the iWire 1 input on the front of the IXTA (refer to the picture below for the complete set-up).



B. Select the LabScribe program on the laptop. Choose the "Reseach" option when prompted. The hardware should be recognized as connected at this point (if you receive an error message, double check your connections and try again). Once the software is loaded, choose "Settings" and "Load Group." Select the folder that says "Complete Settings" and scroll down to choose IPLMv6Complete.iwxgrp. In LabScribe, you can now select "Settings" again and choose the "Human Heart" and then "ECG Simulation" settings file. Your program is now configured for this exercise.

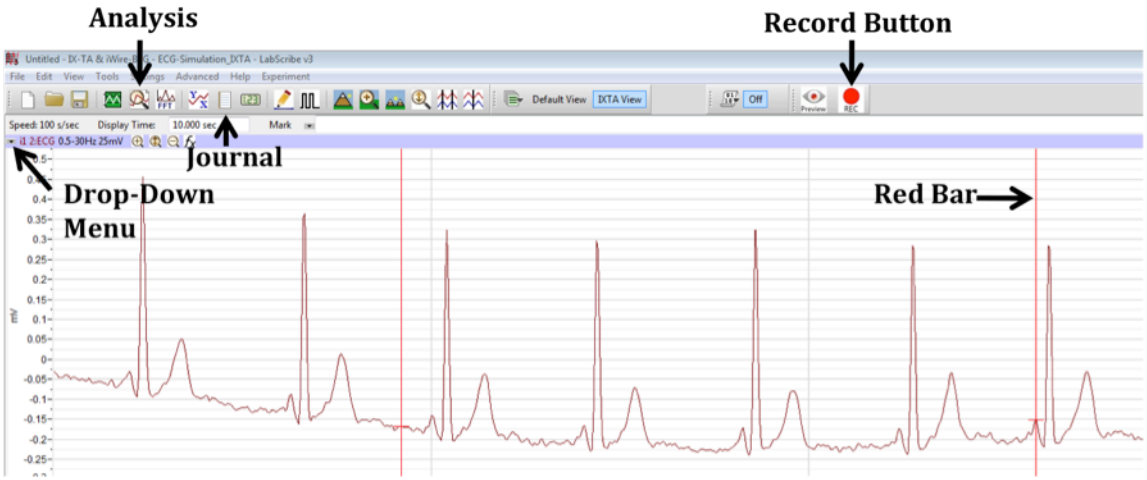
C. Prepare the electrodes for connecting to the subject. The ECG unit is color-coded so that the wires can be matched accordingly. Attach the other end of the red, black, and green wires to new electrodes. Use an alcohol swab to clean the skin where the electrodes will be placed. Make sure all jewelry and other items are removed from wrists and ankles. Turn off cell phones, watches, etc. and move away from the ECG equipment. Place the red electrode on the left wrist (or right below the left clavicle). Place the black electrode on the right wrist (or right below the right clavicle). Place the green electrode on the inside of the right ankle (or on the abdomen).

D. During the ECG recording, the subject should sit and relax their hands in their lap. Be sure to remain very still and avoid talking so that muscle activity isn't accidentally recorded during the ECG. Click "Record" to begin recording the ECG. When 6 clear, continuous cycles are recorded, select the "Stop" button.

E. On the left side of each channel there is a small arrow for a drop down menu. Select this arrow and then choose "Scale" and "Autoscale" if needed to amplify the signal (you should see something similar to the data collected below).

F. Now have the subject carefully exercise for 1 minute (this can include jumping jacks, push-ups, etc.) and be sure that the electrodes aren't moved during this process. Immediately after exercise, have the subject return to a seated, quiet position and record the new ECG. Type "Exercise" into the "Mark" box and then select the "Mark" button to indicate that this is the exercise ECG. When 6 clear, continuous cycles are recorded, select the "Stop" button.

III. DATA COLLECTION



A. To analyze the data collected, center on one of the 6 ECG cycles at rest. Move one of the vertical red bars to the left edge of the data in this section and the other red bar to the right edge of the data in this section. Now select the "Analysis" button. Choose the "Function" button along the top to select V2-V1, T2-T1, and Mean. These values should appear in a table.

B. You can record these values in a journal through LabScribe by selecting the small arrow with the dropdown menu for the channel and then choosing "Add title to journal." Next, click the arrow again and this time select "Add all data to journal." Select the "Journal" button along the top of the screen to view the data collected.

C. Specifically, calculate the R-wave amplitude (first red bar on Q wave and second red bar on peak of R wave), P-wave amplitude (first red bar on baseline before P wave and second red bar on peak of P wave), and T wave amplitude (first red bar on peak of T wave and second red bar on baseline after T wave) and note V2-V1. Now move the red bars to encompass the entire ECG and select the dropdown arrow. Choose "Calculations" and "ECG." You will see several new data points in the journal, record PR interval, QT interval, and PT interval by noting T2-T1. Repeat the analysis for the ECG during exercise.

D. Complete the data table below with your results.

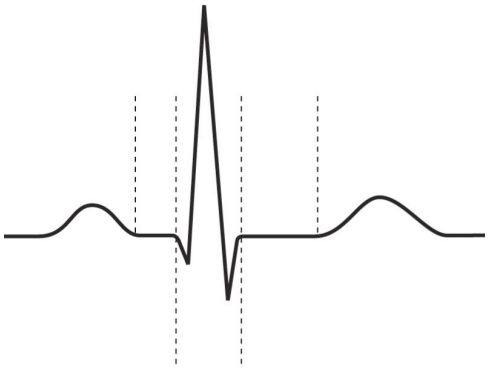
	AT REST			AFTER EXERCISE		
ECG	**P-wave amplitude**	**R-wave amplitude**	**T-wave amplitude**	**P-wave amplitude**	**R-wave amplitude**	**T-wave amplitude**
V2-V1						

	At Rest			After Exercise		
ECG	**P-R interval**	**Q-T interval**	**P-T interval**	**P-R interval**	**Q-T interval**	**P-T interval**
T2-T1						

E. Once all data has been collected and analyzed, be sure to disconnect all equipment and properly return to the storage case. Shut down the program and laptop.

IV. Application Questions

1. Label the ECG trace below with P wave, QRS complex, and T wave. Describe what electrical events are happening during each.



2. The ECG below is recording a first-degree AV node block. Explain what is happening in this condition. How would you characterize the P-R interval?

3. Describe changes to the ECG recording during exercise compared to rest.

V. References

This lab is based on the iWorx lab manual, Experiment HH-11. For more information, visit www.iworx.com. ECG images were taken from McGraw-Hill Co.

CARDIOVASCULAR SYSTEM

Compare and contrast the histology of an artery and vein identifying the layers listed. Identify the following blood vessels using models and pictures. Indicate left and right sides when appropriate.

BLOOD VESSEL HISTOLOGY:

Differentiate artery from vein
Tunica externa
Tunica media
Tunica interna

ARTERIES:

Aorta
Brachiocephalic
Subclavian
Common carotid
External carotid
Internal carotid
Axillary
Brachial
Radial
Ulnar
Renal
Common iliac
External iliac
Internal iliac
Femoral
Popliteal
Anterior tibial

VEINS:

Superior vena cava
Inferior vena cava
Brachiocephalic
Subclavian
External jugular
Internal jugular
Axillary
Cephalic
Brachial
Basilic
Radial
Ulnar
Median cubital
Renal
Common iliac
External iliac
Internal iliac
Femoral
Great saphenous
Popliteal
Anterior tibial

CARDIOVASCULAR SYSTEM

Demonstrate proper technique for obtaining heart rate, pulse, and blood pressure using a stethoscope and sphygmomanometer. Be able to explain in detail the following terms.

BLOOD PRESSURE:
Auscultation
Palpation
Pulse rate
Systolic pressure
Diastolic pressure
Korotkoff sounds
First heart sound
Second heart sound

I. BLOOD PRESSURE

Blood pressure is the force that blood exerts against blood vessels. There are two key pressures measured: 1) **Systolic pressure**: maximum pressure during ventricular contraction and 2) **Diastolic pressure**: lowest pressure during ventricular relaxation. Blood pressure is reported as a value: systolic/diastolic.

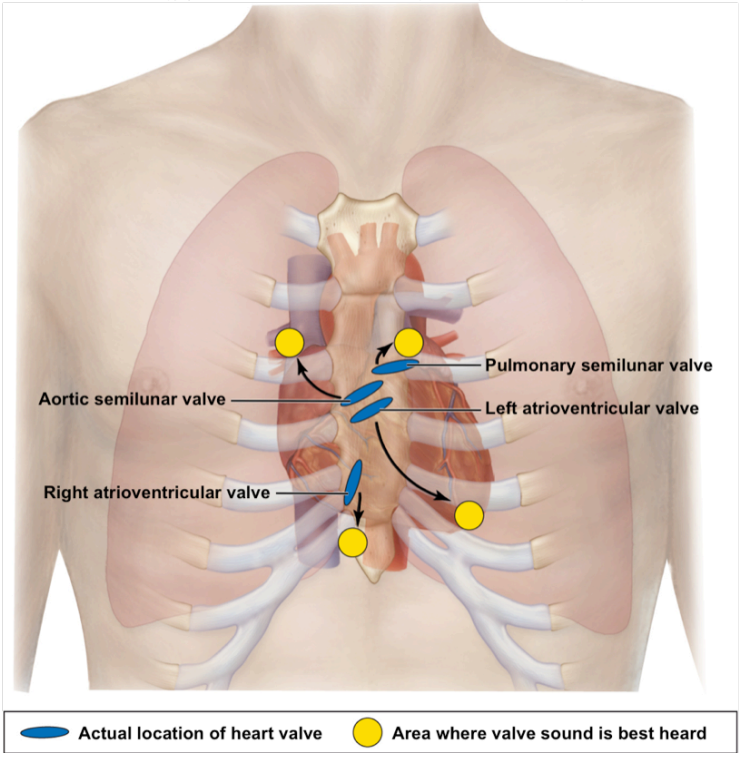
A **sphygmomanometer** (blood pressure cuff) and **stethoscope** are used to measure blood pressure. In this lab, you will collect systolic and diastolic blood pressures from a partner at rest.

To begin, have your partner sit with his/her arm resting on the table. Use an alcohol swab to wipe the stethoscope earpieces and bell. Allow them to dry. Place the sphygmomanometer cuff around the upper arm and the bell of the stethoscope over the brachial artery. Insert the earpieces of the stethoscope and listen (the process of listening to sounds is called **auscultation**). Close the valve on the sphygmomanometer and apply pressure by squeezing the pump until no sounds are heard (the dial is usually between 160-200 mmHg).

Slowly release the pressure by turning the valve and listen for the first sound of blood turbulence (**Korotkoff sounds**). Record the systolic blood pressure. Continue to slowly release the pressure until you no longer hear any turbulence. At that point record the diastolic blood pressure. Release all pressure and remove the sphygmomanometer from your partner.

II. HEART SOUNDS

Heart sounds are due to blood turbulence when a valve closes. The **first sound** results from closing of AV valves during isovolumetric contraction of ventricles ("lub"). The **second sound** results from closing of semilunar valves when pressure of ventricles falls below pressure in arteries ("dub"). To locate these sounds place the stethoscope on your partner at the positions highlighted below:



III. PULSE

The **pulse** results from the expansion of the artery in response to heart contractions and therefore indicates heart rate. There are several pulse points throughout the body including the common carotid, femoral, etc. You will **palpate** the radial artery on your partner at the wrist on the side of the thumb. Count the pulse for one minute and record the data.

IV. DATA COLLECTION

Complete the data table below with the results of your blood pressure and pulse that were determined by your partner.

Pulse (bpm)	Systolic Blood Pressure (mmHg)	Diastolic Blood Pressure (mmHg)

RESPIRATORY SYSTEM

Identify respiratory muscles using models and pictures. Identify respiratory tissues (and associated structures) under the microscope and using pictures. Identify respiratory structures on models and pictures.

RESPIRATORY MUSCLES:
Diaphragm
External intercostals
Internal intercostals

RESPIRATORY HISTOLOGY:
Lung (alveoli, simple squamous epithelium)
Trachea (pseudostratified columnar epithelium, cilia, goblet cells, hyaline cartilage)

RESPIRATORY ANATOMY:
Nasal cavity
Superior nasal conchae
Middle nasal conchae
Inferior nasal conchae
Nasopharynx
Oropharynx
Laryngopharynx
Epiglottis
Larynx
True vocal cords
False vocal cords
Glottis
Trachea
Thyroid cartilage
Cricoid cartilage
Left primary bronchus
Right primary bronchus
Secondary bronchi
Tertiary bronchi
Superior lobe of right lung
Middle lobe of right lung
Inferior lobe of right lung
Superior lobe of left lung
Inferior lobe of left lung

RESPIRATORY SYSTEM

Complete the PhILS #39 lab for Respiration: Exercise-Induced Changes. Calculate respiratory capacities and identify capacities/volumes on a spirogram. Explain the spirometry concepts below and relate this to exercise.

RESPIRATORY VOLUMES:
Tidal volume (TV)
Inspiratory reserve volume (IRV)
Expiratory reserve volume (ERV)
Residual volume (RV)

RESPIRATORY CAPACITIES:
Vital capacity (VC)
Inspiratory capacity (IC)
Functional residual capacity (FRC)
Total lung capacity (TLC)

I. ALVEOLAR VENTILATION

A. **Anatomical dead space**: volume of inspired air that doesn't reach the alveoli for gas exchange.

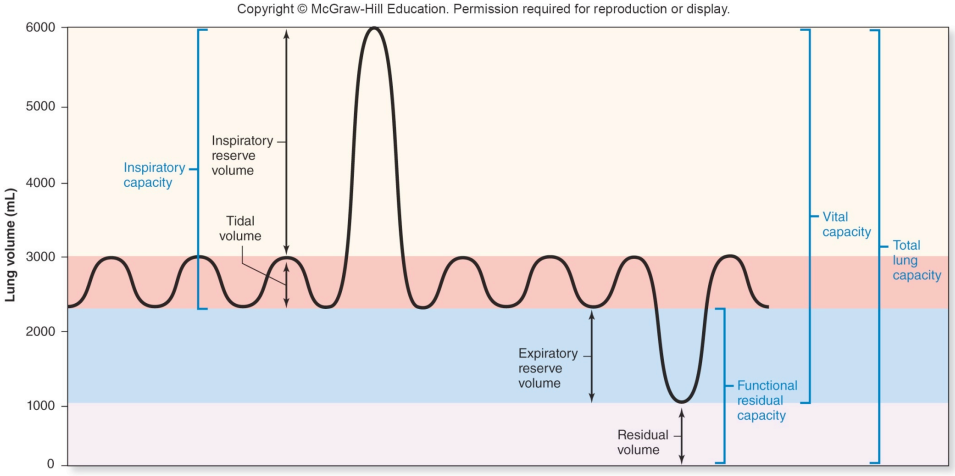
B. **Alveolar ventilation** (the amount of fresh air that enters the alveoli/min)
= (Tidal Volume – Anatomical Dead Space) x Breathing Rate

C. Anatomical dead space remains constant so to adjust alveolar ventilation (keep it constant) need to change TV or breathing frequency.

D. Exercise requires the body to use more oxygen and therefore, breathing must change to respond.

II. SPIROMETRY

Spirometry allows for the measurement of various parameters including expiratory reserve volume, inspiratory reserve volume and tidal volume as seen in the figure below.



III. GOALS OF THE LAB

1. Correctly use a spirometer to measure breathing rate, expiratory reserve volume, inspiratory reserve volume, and tidal volume in a patient at rest and after exercising.

IV. DATA COLLECTION

Complete the data table below with your results.

Trial	Resting TV (mL)	Resting Interval (s)	Exercise TV (mL)	Exercise Interval (s)
#1				
#2				
#3				
Mean				

Breaths/min at rest:
Breaths/min after exercise:

IRV (rest)	IRV (exercise)	TV (rest)	TV (exercise)	ERV (rest)	ERV (exercise)	VC (rest)	VC (exercise)

V. APPLICATION QUESTIONS

1. Compare vital capacity at rest and after exercise:

2. Compare TV at rest and after exercise:

3. Compare breathing rate at rest and after exercise:

4. If the anatomical dead space doesn't change at rest compared to exercise, but TV and breathing rate change, what impact does this have on alveolar ventilation after exercise?

   What advantage does the change in alveolar ventilation provide during exercise?

RESPIRATORY SYSTEM

Complete the PhILS #34 lab for Blood: pH and Hb-Oxygen Binding.

I. HEMOGLOBIN

A. The protein **hemoglobin** contains four heme groups (each of which can bind to oxygen) and four globin groups.

B. Hemoglobin unloads oxygen in tissues and picks up oxygen in lungs (hemoglobin binds oxygen reversibly).

C. The amount of oxygen bound to hemoglobin depends on the amount of oxygen available, and this can be described by the **oxygen dissociation curve**. The amount of oxygen bound to hemoglobin also depends on pH, temperature and 2,3-DPG. Oxygen levels decrease when placed under vaccuum (pressure decreases).

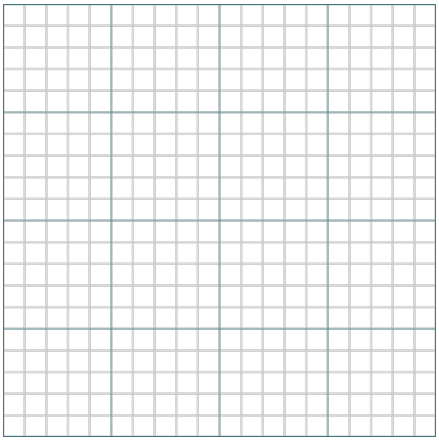
II. GOALS OF THE LAB

1. Prepare hemoglobin solutions at various pH values from sheep blood.
2. Use a spectrophotometer to measure the blood color of samples at various vacuum levels (oxygen pressures). The amount of light transmitted indicates the amount of bound oxygen.
3. Determine the effect of pH on the amount of oxgyen bound to hemoglobin.

III. DATA COLLECTION

Complete the data table below with your results and plot the data on the graph provided.

PO_2	pH 6.8	pH 7.4	pH 8.0
160			
140			
120			
100			
80			
60			
40			
20			
0			



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IV. APPLICATION QUESTIONS

1. How many oxygen molecules can one hemoglobin protein bind?

2. As the partial pressure of oxygen is decreased, what happens to amount of oxygen bound to hemoglobin?

3. When the transmittance value is high, what does this indicate about the color of the blood sample? What does this indicate about the amount of oxygen bound to hemoglobin?

4. Decreasing pH (making it acidic, such as in exercising muscles) moves the oxygen dissociation curve in which direction? What does this indicate about the amount of oxygen bound to hemoglobin?

5. What happens to temperature in exercising muscles?

   Which direction does this move the oxygen dissociation curve? What does this indicate about the amount of oxygen bound to hemoglobin?

6. Increasing 2,3-DPG concentration moves the oxygen dissociation curve in which direction? What does this indicate about the amount of oxygen bound to hemoglobin?

LYMPHATIC SYSTEM

Identify the following lymphatic pathway structures and nodes using models and pictures. Locate lymphatic organs on models and pictures and identify histology (and associated structures) under the microscope.

LYMPHATIC PATHWAYS:

Lymphatic capillary
Lymphatic vessels
Lymphatic trunks
- Jugular trunk
- Subclavian trunk
- Bronchomediastinal trunk
- Intestinal trunk
- Lumbar trunk

Right lymphatic duct
Cisterna chyli
Thoracic duct

VEINS:

Right brachiocephalic vein
Right internal jugular vein
Right subclavian vein
Left internal jugular vein
Left subclavian vein
Left brachiocephalic vein
Superior vena cava

LYMPH NODES:

Cervical lymph node
Inguinal lymph node
Axillary lymph node
Afferent lymphatic vessel
Efferent lymphatic vessel
Hilum
Trabeculae
Cortex
- Lymphatic nodule
- Germinal center

Medulla
- Medullary cord

TONSILS:

Pharyngeal tonsil
Palatine tonsils
Lingual tonsils

THYMUS HISTOLOGY:

Cortex
Medulla

SPLEEN HISTOLOGY:

White pulp
Red pulp
Capsule

DIGESTIVE SYSTEM

Identify the following digestive system structures using models and pictures. Examine small intestine histology under the microscope and identify the associated structures.

DIGESTIVE SYSTEM:

- Oral cavity
- Hard palate
- Soft palate
- Vestibule
- Tongue
- Teeth
  - Incisors
  - Canines
  - Premolars
  - Molars
- Uvula
- Salivary glands
  - Parotid glands
  - Submandibular glands
  - Sublingual glands
- Pharynx
- Esophagus
  - Superior esophageal sphincter
  - Inferior esophageal sphincter
- Stomach
  - Rugae
  - Greater curvature
  - Lesser curvature
  - Cardia
  - Fundus
  - Body
  - Pylorus
  - Pyloric sphincter
- Small intestine
  - Duodenum
  - Jejunum
  - Ileum (differentiated from jejunum histologically by Peyer's patches)
  - Ileocecal sphincter
- Pancreas
  - Head, body, tail
  - Pancreatic duct
  - Hepatopancreatic ampulla
- Liver
  - Right lobe
  - Left lobe
  - Falciform ligament
  - Round ligament
  - Hepatic artery
  - Hepatic portal vein
  - Hepatic duct
  - Common bile duct
  - Hepatocyte
  - Hepatic sinusoid
  - Kupffer cells
  - Bile canaliculi
  - Central vein
  - Hepatic triad
- Gallbladder
  - Cystic duct
- Large intestine
  - Cecum
  - Appendix (lymphatic tissue)
  - Ascending colon
  - Transverse colon
  - Descending colon
  - Sigmoid colon
  - Rectum
  - Anal canal
  - External anal sphincter
  - Internal anal sphincter
  - Anus

SMALL INTESTINE HISTOLOGY:

- Lumen
- Mucosa
- Submucosa
- Muscularis
- Serosa

NUTRITION AND METABOLISM

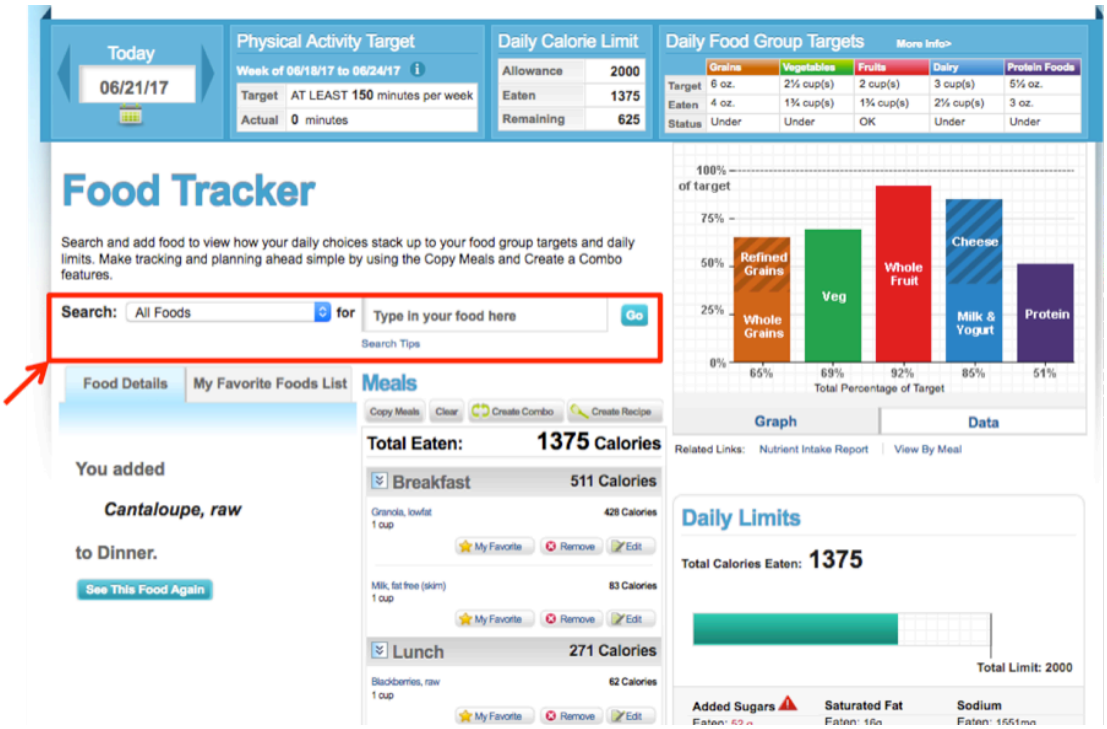
Complete the following activity to explore concepts of nutrition and metabolism.

I. INTRODUCTION

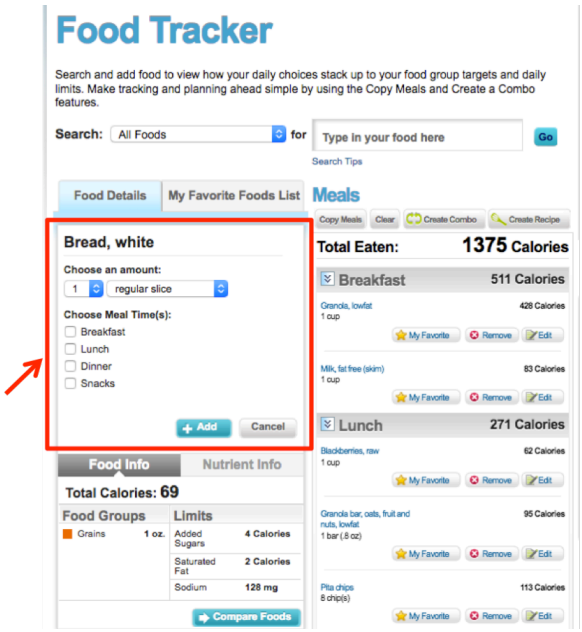
Nutrition is the study of how organisms obtain and use nutrients they need to live. A diet balanced in fruits, vegetables, protein, grains, and dairy with an appropriate variety of food and proportions is considered healthy according to the MyPlate guide. This lab will explore your individual nutritional goals by tracking food for one day.

II. LAB INSTRUCTIONS

In this lab, you will use the USDA MyPlate website to track one day of food intake. Go to the following website: https://www.supertracker.usda.gov/foodtracker.aspx. Use the search feature to locate foods and quantities consumed for breakfast, lunch, and dinner (see figure below).



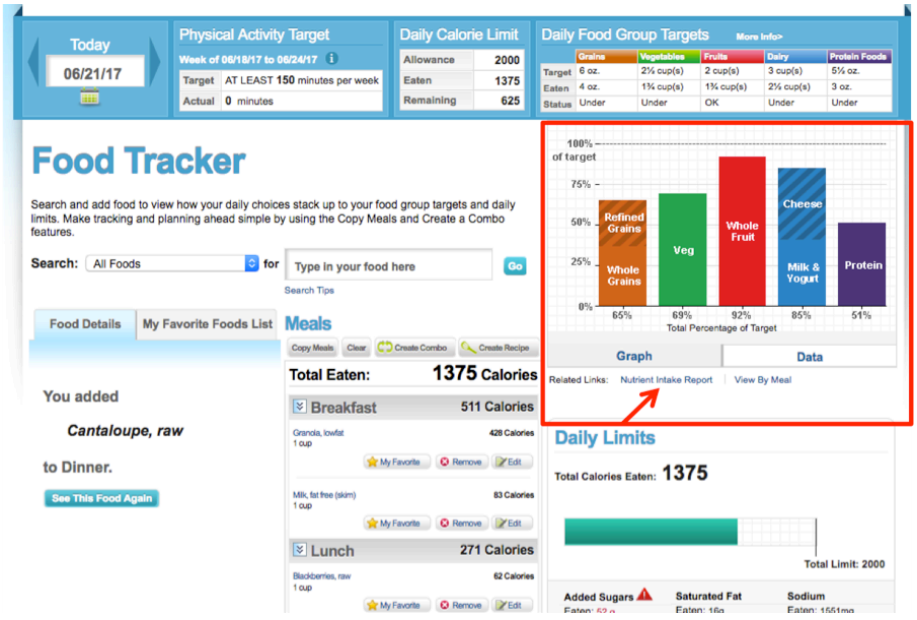
Once you have located your food item, complete the details regarding quantity and categorize by meal (breakfast, lunch, etc.).



Continue adding items until all meals for one day are accurately recorded.

III. Data Analysis

Examine your results using the graph of daily food group targets. View a summary by clicking on the "nutrient intake report."



IV. Application Questions

1. Summarize your personal results for food intake. Did you meet your target goals? What changes can be made to diet to improve overall health?

2. Although not completed in this lab, the website also provides a physical activity tracker. How does exercise impact nutrition and overall health?

3. The MyPlate website is just one of many resources available for tracking nutrition information. Explore other options and list two of them below. What are advantages and disadvantages of each?

4. In this lab, food was tracked for only one day. Is this an accurate representation of an individual's diet? How can this lab be improved?

URINARY SYSTEM

Identify the following urinary system structures using models and pictures. Complete the urinalysis experiment and explain the concepts listed below.

URINARY SYSTEM:

Kidney
- Renal capsule
- Renal cortex
- Renal sinus
- Renal papilla
- Renal pyramid
- Renal pelvis
- Major calyx
- Minor calyx
- Renal column
- Renal medulla

Nephron
- Renal corpuscle
  - Glomerulus
    - Afferent arteriole
    - Efferent arteriole
  - Glomerular capsule
- Renal tubule
  - Proximal convoluted tubule
  - Descending limb of nephon loop
  - Ascending limb of nephron loop
  - Distal convoluted tubule
- Collecting duct
- Ureter
- Urinary bladder
  - Trigone
- Urethra

URINALYSIS:

Explain how color, pH, glucose, protein, and specific gravity can be used to determine diseases present based on urine samples.

ENDOCRINE SYSTEM

Locate the following endocrine glands in the body using pictures and models. Identify hormones from each. Examine histology under the microscope of glands listed below and identify the associated structures.

ANTERIOR PITUITARY:
Growth Hormone (GH)
Prolactin (PRL)
Thyroid-stimulating hormone (TSH)
Adrenocorticotropic hormone (ACTH)
Follicle-stimulating hormone (FSH)
Luteinizing hormone (LH)

POSTERIOR PITUITARY:
Antidiuretic hormone (ADH)
Oxytocin (OT)

THYROID:
Thyroxine (T_4)
Triiodothyronine (T_3)
Calcitonin

PARATHYROID:
Parathyroid hormone (PTH)

HISTOLOGY:
Thyroid gland (follicular cell, colloid)
Adrenal gland (3 zones of cortex and medulla)
Pancreas (pancreatic islet)

ADRENAL:
Medulla
- Epinephrine
- Norepinephrine

Cortex
- Aldosterone (outer zone)
- Cortisol (middle zone)
- Sex hormones (inner zone)

PANCREAS:
Glucagon (alpha cells)
Insulin (beta cells)

TESTES:
Testosterone
Inhibin

OVARIES:
Estrogen
Progesterone
Inhibin

ENDOCRINE SYSTEM

Complete the PhILS #20 lab for Endocrine Function: Insulin and Glucose Tolerance.

I. GLUCOSE

A. **Glucose** is used to make ATP in cellular respiration. Its levels are regulated by negative feedback and are normally between 70-110 mg/dl.

B. After eating, glucose is high and **insulin** is released from beta cells of the pancreas (Islets of Langerhans) to lower blood glucose levels. If glucose remains elevated in the blood, then water is drawn out of cells and they crenate.

C. Insulin works to decrease blood glucose levels by increasing glucose uptake by cells through an increase of GLUT-4 transporters in the cell membrane.

II. DIABETES MELLITUS

A. Levels of insulin are decreased or ineffective and therefore blood glucose levels are high (**hyperglycemia**).

B. There are two types of Diabetes Mellitus:

1. **Type I** – 5% of the diabetic population, an autoimmune disorder that results in the destruction of beta cells, treated with insulin injections.
2. **Type II** – 95% of the diabetic population, the body doesn't respond to insulin (**insulin resistance**), associated with obesity and usually develops over time. Treatment includes diet, exercise, and possibly drugs like metformin.

C. Diabetes is often diagnosed with the **glucose tolerance test**. During this test, the patient drinks a glucose solution and blood glucose levels are measured over 2 hours. With diabetes, the blood glucose level is higher (greater than 200 mg/dl after 2 hours) and takes longer to decrease over time.

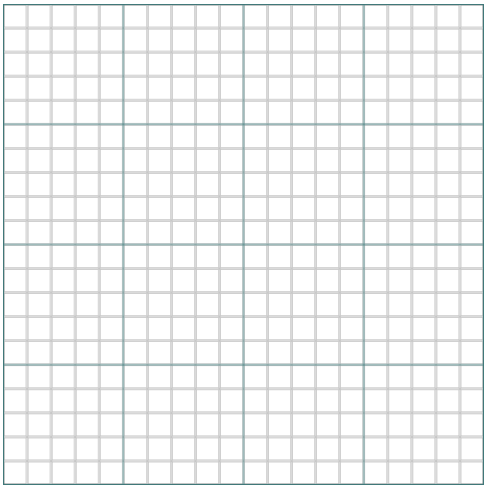
III. GOALS OF THE LAB

1. Correctly use a glucometer to measure blood glucose levels in three patients who have consumed two cans of decaffeinated soda (78 grams glucose total).

IV. DATA COLLECTION

Complete the data table below with your results and plot the data on the graph provided.

Table 1: Andy		Table 2: Bev		Table 3: Chris	
Time	**Glucose concentration**	**Time**	**Glucose concentration**	**Time**	**Glucose concentration**



Graph paper image: https://commons.wikimedia.org/wiki/File:Graph-paper.svg

V. APPLICATION QUESTIONS

1. What happens to blood glucose levels immediately after consuming soda and then over time under normal circumstances?

2. Who had the highest blood glucose level at the beginning of the experiment?

3. When did Andy and Bev have the highest blood glucose levels during the study? How about Chris?

4. What caused blood glucose levels to drop in Andy and Bev? What is happening with Chris?

5. Compare the ending and starting blood glucose levels in all three patients.

6. Which patient has suspected diabetes?

REPRODUCTIVE SYSTEM

Identify the following male and female reproductive system structures using models and pictures.

MALE REPRODUCTION:

Testes
Scrotum
Epididymis
Ductus deferens
Seminal vesicle
Ejaculatory duct
Prostate gland
Bulbourethral gland
Urethra
Penis
    Corpus cavernosum
    Corpus spongiosum
    Glans penis
External urethral orifice

FEMALE REPRODUCTION:

Ovary
Fimbriae
Uterine tube
Uterus
Cervix
Vagina
Vaginal orifice
Urethra
External urethral orifice
Clitoris
Labium majus
Labium minus

DISSECTIONS

Complete dissections of the **cat** identifying the structures listed below. A supplemental handout with instructions and pictures will be provided.

CARDIOVASCULAR SYSTEM:

Heart
- Aortic arch
- Atria v. ventricles
- Auricles
- Abdominal aorta
- Superior and inferior vena cava

RESPIRATORY SYSTEM:

Lungs – right and left
Trachea
Thyroid cartilage
Cricoid cartilage
Epiglottis
Diaphragm

DIGESTIVE SYSTEM:

Esophagus
Liver
Gallbladder
- Cystic duct

Pancreas
Stomach
- Rugae
- Pyloric sphincter

Omentum
Mesentery
Small intestine
- Duodenum
- Jejunum
- Ileum

Large intestine
- Cecum
- Colon

LYMPHATIC SYSTEM:

Spleen

URINARY SYSTEM:

Kidney
- Medulla v. cortex
- Renal artery and vein

Ureter
Urinary bladder

REPRODUCTIVE SYSTEM:

Uterine horns (female only)
Ovary (female only)