BI 104 Lab Handout
(Marieb Lab Manual 9th Edition)

Students are responsible for completing the Review Sheets in the lab manual that support the lab exercises performed in class. Some items on the Review Sheets may not have been covered in lab. These items may be omitted. Refer to the course objectives and the lab handouts to determine which items may be omitted.

Lab 1 : Exercise 29A (Blood)

LAB SAFETY-Become familiar with the Laboratory Safety Guidelines on the inside cover of the lab manual.

PRECAUTIONS:

1. As you learned in BI 103, students must use an approved disinfectant and paper towels to wash their work surfaces (including the edges of the tables) at the beginning of each lab period, immediately after any spill, and at the end of each lab period. Students must wash their hands with soap and water immediately before leaving the laboratory room (C 106).

2. Safe handling of blood, blood components, and blood-contaminated material will be explained in detail at the beginning of today's lab, during which students will draw their own blood.

3. A student may take blood only from herself/himself, and may handle only her/his own blood, blood fractions, and blood-contaminated material.

4. No blood-containing or blood-contaminated equipment will ever be placed directly on a table or counter surface. Students will use paper towels as a "placemat" for all bloody materials, which include used alcohol swabs, lancets, capillary tubes, hematocrit tubes, hemoglobin cuvettes and glucose cuvettes.

5. Any blood spill on the table, floor, chair, equipment, etc., will be covered immediately with a paper towel soaked in vesphene.
A student will be assigned to guard the spill until the paper towel soaked in disinfectant is in place.
The instructor must be informed of any spill and will supervise the cleanup.

6. All DRY, blood-contaminated, disposable non-glass (and non-sharp) material will be placed in the BIOHAZARD BAG in the center of the lab table. Do not put non-bloody paper towels, scrap paper, or wrappers in the BIOHAZARD BAGS.

All glass (breakable) bloody disposable items and sharp items will be placed in the PLASTIC BIOHAZARD CONTAINER in the center of the lab table. Do not put paper towels, scrap paper, or wrappers in the PLASTIC BIOHAZARD CONTAINERS.

7. Do not pour any blood or blood components down the sink drain.

After the lab, the instructor will take the containers of glassware and waste to the Prep Room (C 105) for appropriate treatment.

Additional precautions:

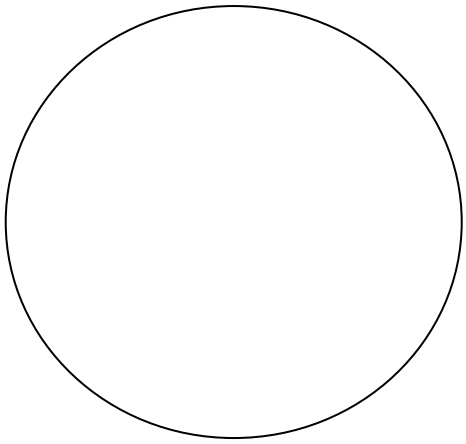
Do not hang clothes or purses from the back of the lab stools.
Book bags must be stowed under the lab tables – clear of the aisles.

To spare yourself from having an excess number of finger pricks, carefully plan what you will do during this lab, and lay out on your placemat EVERYTHING that you will need before getting your blood sample. (See example below.)

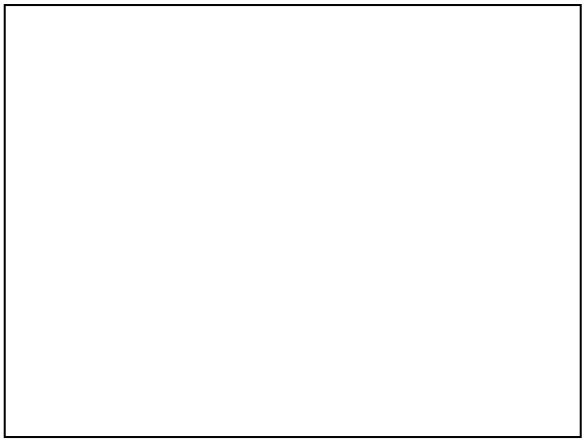
COMPOSITION OF BLOOD: pp. 424-428

PHYSICAL CHARACTERISTICS OF PLASMA (Activity 1): pp. 425-426

FORMED ELEMENTS OF THE BLOOD (Activities 2): pp. 426-428 After we have discussed the different types of white blood cells, examine commercially prepared blood slides available in the lab. In the circle below, draw a representative microscope field (oil immersion) showing the size of the RBC in relation to the WBC and platelets and the approximate number of each cell in the field.



In the square below, draw a neutrophil, lymphocyte, eosinophil, basophil, and monocyte. Show their relative sizes.



SUGGESTED ORDER OF ACTIVITIES FOR BLOOD LAB

1. Read everything and be sure that you understand what you are to accomplish.

2. Set up materials on paper towel placemat

SUGGESTION FOR SETTING UP MATERIAL ON PAPER TOWEL PLACEMAT:

Alcohol swabs Cotton balls Stylets or Lancets	Hct tube and cap	Hemoglobin cuvette	Eldoncard stirrers(4), and pamphlet	Glucose cuvette

3. Mentally rehearse safety precautions.

4. Wash and rinse hands with hot water. Be sure that your hands are warm.

5. Use an alcohol swab to clean the site to be punctured. Hold your arms down by your side and move your hands around to get the blood flowing to your hands. Lay the hand to be used for the blood sample on the placemat, then quickly make the puncture wound in your finger, holding the finger so that there is a nice bead of blood at the end of your finger. The blood should be flowing freely and should not be smeared all over the tip of the finger.

6. Order of sampling:

   HEMATOCRIT DETERMINATION (Activity 4): pp. 430-432 Touch the Hct tube to the drop of blood on your fingertip until the tube is half full. **Plug the bloody end before you put the Hct tube down on the placemat (and before you centrifuge!)**. The Hct tube can be centrifuged later.

   HEMOGLOBIN DETERMINATION (we will use a procedure that's different from the one in the lab manual): Touch the hemoglobin (Hb) cuvette to the drop of blood on your fingertip. Place the cuvette in the hemoglobin instrument on the side lab bench within ten minutes after filling the cuvette and obtain Hb value.

   BLOOD TYPING (also different): Follow the instructions for mixing the blood on the ABO typing card (Eldon Card).

   GLUCOSE DETERMINATION (not in lab manual, follow directions supplied with instrument): Touch the glucose cuvette to the drop of blood on your fingertip. Place the cuvette in the glucose instrument on the side lab bench. NOTE: Hemoglobin and glucose readers are different. Do not try to force cuvettes.

7. Swab your wound with alcohol: elevate the finger if bleeding continues.

Complete the appropriate parts of the Review Sheet for Ex 29A.

BLOOD TYPE WORKSHEET

1. Mr. Smith has type O^+ blood. What kind of blood can he safely be given? _____

2. If Mr. Smith accidentally receives type A^+ blood, what will happen?
_____
_____
_____

3. Now Mr. Smith wants to donate blood. To whom can he donate? _____ If Mrs. Smith had O^- blood, to whom can she donate? _____

4. Mrs. Jackson has type B^- blood. She needs a pint of blood. What kind of blood can she safely be given? _____

5. If Mrs. Jackson accidentally receives AB^- blood, what will happen?
_____

6. Now Mrs. Jackson can give blood to someone else. To whom can she donate blood? _____

7. Why can't Mrs. Jackson receive B^+ blood?
_____
_____

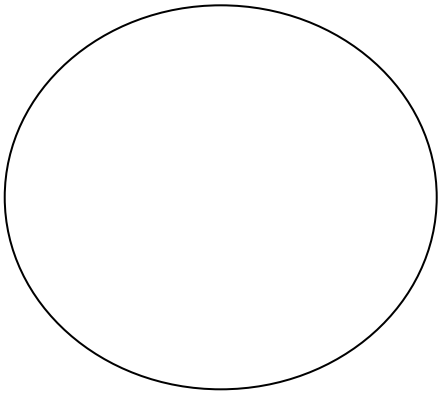
Lab 2: Exercise 30 (Anatomy of the Heart)
Exercise 34B: Frog Cardiovascular Physiology-Computer Simulation

Exercise 30

GROSS ANATOMY OF THE HUMAN HEART: pp. 443-447 Identify the following structures on the models of the human heart and manikins:

- apex
- base
- endocardium
- myocardium
- epicardium (visceral pericardium)
- parietal pericardium on tranverse manikin
  - fibrous parietal pericardium
  - serous parietal pericardium on sheep heart
- atrioventricular groove (sulcus)
- interatrial septum
- interventricular septum
- left atrium; left auricle
- right atrium; right auricle
- left ventricle
- right ventricle
- aortic semilunar valve
- bicuspid valve (mitral valve)
- pulmonary semilunar valve
- tricuspid valve
- chordae tendineae
- fossa ovalis (foramen ovale)
- papillary muscle
- pectinate muscle
- trabeculae carneae
- aorta
- coronary sinus
- inferior vena cava
- ligamentum arteriosum (ductus arteriosus)
- pulmonary trunk; left and right pulmonary arteries
- left and right pulmonary veins
- superior vena cava
- left coronary artery
  - anterior interventricular artery (left anterior descending 'LAD')
  - circumflex artery
- right coronary artery
  - marginal artery
  - posterior interventricular artery
- cardiac veins
  - great, middle, small

MICROSCOPIC ANATOMY OF CARDIAC MUSCLE: pp. 448-449 Draw a section of cardiac muscle as it appears through high power of the microscope. Label intercalated disc, nucleus, striations



DISSECTION OF THE SHEEP HEART: pp. 449-452

Complete the appropriate parts of the Review Sheet for Ex 30.

Exercise 34B: Frog Cardiovascular Physiology-Computer Simulation (page Pex-97), Activities 1-9. Perform all 9 activities, fill out the lab manual, and bring the completed lab and the required printouts to lab next week for review.

Lab 3: Exercise 31 (Conduction System and Electrocardiography)
Exercise 33A (Heart Sounds and Pulse)
Exercise 34B Review (Frog Cardiovascular Physiology: Computer Simulation)

Exercise 31

INTRINSIC CONDUCTION SYSTEM: pp. 457-458
- SA (sinoatrial) node
- AV (atrioventricular) node
- AV bundle (bundle of His)
- Right and left bundle branches
- Purkinje fibers

ELECTROCARDIOGRAPHY: pp 458-466
- Follow the directions for our equipment given by your lab instructor.
- Record an ECG for each student (standard limb leads I, II, and III): p. 460
- For one student at each table, make a "running-in-place recording" and a "breath-holding recording": p. 461

Exercise 33A

HEART SOUNDS AND PULSE: pp. 491-495
Each student serves as the subject and also as the investigator for the following exercises:

AUSCULTATION OF HEART SOUNDS: p. 493

SUPERFICIAL PULSE POINTS: p. 494

Exercise 34B: Review results

Complete the appropriate parts of the Review Sheet for Ex 31 and 33A.
Complete the appropriate parts of the Review Sheet for Ex 34B.

Lab 4: Exercise 33A (Blood Pressure)
Exercise 32 (Anatomy of Blood Vessels-Arteries, Human)

Exercise 33A

Each student serves as the subject and also as the investigator for the following exercises:

BLOOD PRESSURE DETERMINATIONS: p. 497

EFFECT OF VARIOUS FACTORS ON BLOOD PRESSURE AND HEART RATE: Posture and Exercise p. 500

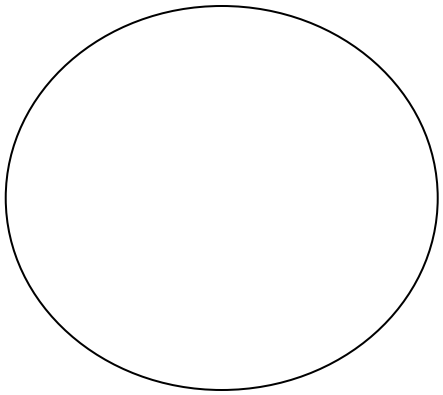
Each student at your table should serve as the subject for one or two of the following exercises:

VASODILATION AND FLUSHING OF THE SKIN DUE TO LOCAL METABOLITES: p. 502

EFFECTS OF VENOUS CONGESTION: p. 503

Exercise 32: Anatomy of Blood Vessels

MICROSCOPIC STRUCTURE OF THE BLOOD VESSELS: p. 469 Draw the cross section of an artery and vein as seen with 10X objective. Label each.



MAJOR SYSTEMIC ARTERIES: p. 472 On diagrams, models, and manikins, locate the following human vessels:

Arteries

Head and Brain
ascending aorta
common carotid artery
internal carotid artery
external carotid artery
cerebral arteries
anterior cerebral artery

anterior communicating artery
basilar artery
middle cerebral artery
posterior cerebral artery
posterior communicating artery

Aortic Arch and Thoracic Aorta
aortic arch
thoracic aorta
coronary artery
brachiocephalic artery
common carotid artery (again)
internal carotid artery (again)
external carotid artery (again)
subclavian artery
vertebral artery
descending aorta

Shoulder and Upper Limb
subclavian artery (again)
axillary artery
brachial artery
radial artery
ulnar artery

Abdomen
abdominal aorta
celiac trunk & branches:
- left gastric artery
- splenic artery
- common hepatic artery

superior mesenteric artery
renal artery
gonadal artery
inferior mesenteric artery

Lower Limb
common iliac artery
internal iliac artery
external iliac artery
femoral artery
deep femoral artery
popliteal artery

Complete the appropriate parts of the Review Sheets for Ex 32 and 33A.

Lab 5: Exercise 32 (Anatomy of Blood Vessels-Veins, Human)
Dissection Exercise 4 (Blood Vessels of the Cat)

Exercise 32 (Anatomy of Blood Vessels)

Veins

Veins draining into the inferior vena cava from the legs
inferior vena cava
common iliac vein
internal iliac vein
external iliac vein
femoral vein
great saphenous vein

Veins draining into the inferior vena cava from the abdomen
renal vein
gonadal vein
inferior mesenteric vein (part of hepatic portal system)
superior mesenteric vein (part of hepatic portal system)
hepatic vein
hepatic portal vein (part of hepatic portal system)
splenic vein (part of the hepatic portal system)

Veins draining into the superior vena cava from the head and neck
superior vena cava
brachiocephalic vein
internal jugular vein
vertebral vein
subclavian vein
external jugular vein

Veins draining into the superior vena cava from the upper limb and thorax
brachial vein
axillary vein
cephalic vein
basilic vein
median cubital vein

Dissection Exercise 4 (Blood Vessels of the Cat)

BLOOD VESSELS OF THE CAT: p. 731

As you dissect out the arteries and veins, you will encounter a number of other structures in the neck, thorax, and abdominopelvic cavity. Some of these structures will need to be moved and/or cut to identify the arteries and veins. You should attempt to make a preliminary identification of these structures at this point in time (see list below) even though some of the organ systems have not yet been studied.

larynx	thyroid cartilage
thymus	heart
lungs	lobes of the lungs
trachea	primary bronchi
pleural cavities	mediastinum
diaphragm	phrenic nerve
liver	stomach
spleen	pancreas
small intestine	large intestine

Locate the following vessels on a preserved cat specimen:

abdominal aorta
aortic arch
axillary artery
brachial artery
brachiocephalic artery
celiac trunk and branches:
  left gastric artery
  splenic artery
  hepatic artery
common carotid artery
deep femoral artery
external carotid artery
external iliac artery
femoral artery
genital artery
renal artery
superior mesenteric artery
inferior mesenteric artery
subclavian artery

axillary vein
brachial vein
brachiocephalic vein
cephalic vein
common iliac vein
deep femoral vein
external jugular vein
external iliac vein
femoral vein
superior vena cava (precava)
great saphenous vein
hepatic portal vein
vertebral vein
inferior mesenteric vein
superior mesenteric vein
inferior vena cava (post cava)
internal jugular vein
median cubital vein
popliteal vein
renal vein
subclavian vein
hepatic vein

Complete the appropriate portions of the Review Sheet for Exercise 32 and Dissection Exercise 4.

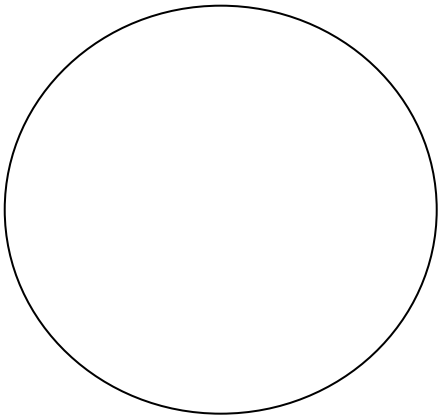
Lab 6: Exercise 35 (Lymphatic System)
Exercise 36 (Anatomy of the Respiratory System)
Exercise 37B (Respiratory System Mechanics)

Exercise 35: Lymphatic System

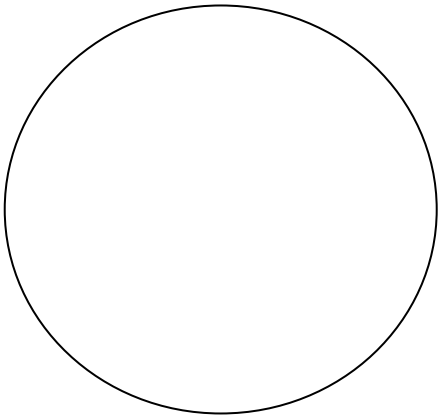
LYMPHATIC SYSTEM: p. 525 Locate the following on models, manikins, and diagrams:
cervical lymph nodes
axillary lymph nodes
inguinal lymph nodes
lymphatics (capillaries, collecting vessels, trunks)
cisterna chyli
thoracic duct
palatine tonsils
pharyngeal tonsils (adenoids)
spleen
thymus

MICROSCOPIC ANATOMY OF THE LYMPH NODE: p. 528 Locate the following on lumph node models and a slide of a lymph node:
capsule
subcapsular sinus
hilus
afferent and efferent lymph vessels, valves
cortex
- follicle (mostly T lymphocytes)
- germinal center (mostly B lymphocytes)
- trabeculae
- medulla
- medullary cords (macrophages)
- medullary sinus

Using the low power objective, draw a lymph node and label all of the parts that are visible.



MICROSCOPIC ANATOMY OF THE SPLEEN: p. 528
Examine a slide of the spleen and draw a representative view below. Label the capsule, trabeculae, red pulp, and white pulp.



Exercise 36: Respiratory Anatomy

UPPER RESPIRATORY SYSTEM STRUCTURES: p. 537 On models, manikins and diagrams, identify:

External nares
Nasal cavity
Nasal septum
Conchae (inferior, middle, superior)
Paranasal sinuses (ethmoid, sphenoid, maxillary, frontal)
Respiratory mucosa
Hard and soft palates
Pharynx (naso-, oro-, laryngo-)
Larynx (thyroid, cricoid, and epiglottic cartilages)
Epiglottis
Vocal folds (false and true)
Trachea

LOWER RESPIRATORY SYSTEM STRUCTURES: p. 540 On models, manikins and diagrams, identify:

<u>conducting zone structures</u>
trachea
- bronchial arteries and veins
- pulmonary arteries and veins

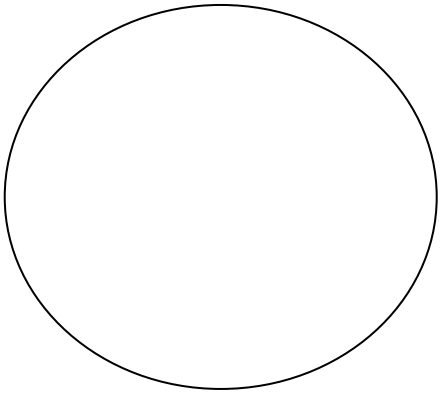
carina
primary, secondary and tertiary bronchi
lung (left and right)
- hilus
- lobes
- apex and base
- cardiac notch
- anatomical dead space

pleura
- parietal
- visceral

diaphragm
external and internal intercostal muscles

<u>respiratory zone structures</u>
respiratory bronchioles
alveolar ducts
alveolar sacs
alveoli
respiratory membrane

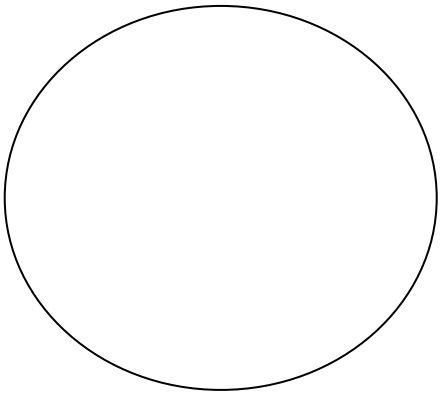
On slides, draw a microscopic view of the trachea and label the;
- lumen
- ciliated pseudostratified epith.
- hyaline cartilage
- smooth muscle
- glands



On slides, draw a microscopic view of the lung and label the;

bronchiole
- lumen
- ciliated columnar epith.
- hyaline cartilage
- smooth muscle

alveolar sacs (simple squamous epith.)



Complete the appropriate parts of the Review Sheets for Exercises 35 and 36.

Exercise 37B: Respiratory System Mechanics-Computer Simulation (page Pex-109), Activities 1-6. Perform all 6 activities, fill out the lab manual, and bring the completed lab and the required printouts to lab next week for review.

Lab 7: Exercise 37A (Respiratory System Physiology)
Exercise 37B (Respiratory System Mechanics-review)

RESPIRATORY SYSTEM PHYSIOLOGY: p. 549

Respiratory Sounds-p.551

Respiratory Volumes and Capacities-p. 551

Using the hand-held or water displacement spirometers, find the:
- tidal volume
- minute respiratory volume
- expiratory reserve volume
- vital capacity
- inspiratory reserve volume

If your results are different from the predicted values (Tables 37A.1 and 37A.2), explain the possible reasons.

Using the vitallograph, determine the:
Forced vital capacity
Forced expiratory volume (FEV1)

Compare your results with the predicted values (average, normal) values for your sex, height, and age.

PULMONARY VENTILATION AND THE REMOVAL OF CARBON DIOXIDE: p. 566
As you have learned, one of the products of aerobic cellular respiration is CO_2. Write the equation for aerobic cellular respiration here:

Demonstrating the Reaction Between Carbon Dioxide and Water-p. 567
Observing the Operation of Standard Buffers-p. 567
Exploring the Operation of the Carbonic Acid-Bicarbonate Buffer System-p. 567

Complete the appropriate parts of the Review Sheet 37A.

Lab 8: **Lab Exam 1**

Approximate distribution of Questions on Lab Exam 1

Exc. 29: Blood	10
Exc. 30: Anatomy of the heart	8
Exc. 31: Conduction system, ECG	5
Exc. 32: Blood vessels	16 (5 cat and 11 human)
Exc. 33: BP and pulse	8
Exc. 34: Frog cardiovascular physiology	3
Exc. 35: Lymphatics	3
Exc. 36: Respiratory anatomy (human)	5
Exc. 37: Respiratory physiology	5

Lab 9: Exercise 38 (Anatomy of the Digestive System)

Exericse 38

DIGESTIVE SYSTEM ANATOMY: p. 575
On manikins, models, and cats, identify:

Oral Cavity
labia
palate: hard; soft
uvula
tongue
lingual frenulum
vestibule
salivary glands
- parotid
- sublingual
- submandibular

Teeth
incisor
canine
premolar (bicuspid)
molar
crown
root
alveolus
gingiva
enamel
cementum
dentin
pulp cavity
root canal
apical foramen

Esophagus/Gastroesophageal junction

Stomach
cardiac region
fundus
body
pyloric region
pyloric sphincter
greater and lesser curvatures
greater and lesser omenta
parietal peritoneum
visceral peritoneum
rugae

Liver and Gallbladder
common bile duct
hepatic duct
cystic duct
gall bladder

Small Intestine
mesentery
duodenum
jejunum
ileum
villi
ileocecal junction, ileocecal valve
duodenal papilla
hepatopancreatic ampulla

Large Intestine
cecum
appendix
ascending colon
hepatic flexure (right colic)
transverse colon
splenic flexure (left colic)
descending colon
sigmoid colon
rectum
anal canal, anal sphincters
anus
teniae coli
haustra

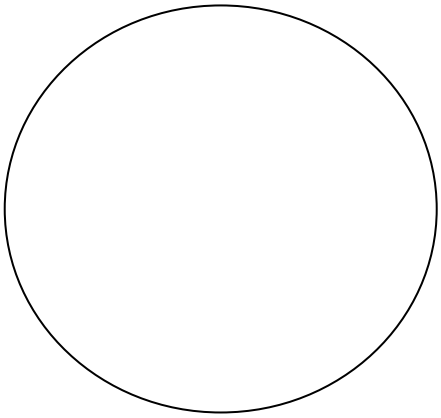
Draw a microscopic view of the **mucosa of gastroesophageal junction** and label the:

- lamina propria
- muscularis mucosae

submucosa
muscularis externa

- circular layer
- longitudinal layer
- oblique layer

serosa or adventitia
gastric gland, gastric pit
epithelium (note type in each organ)
gastroesophageal junction

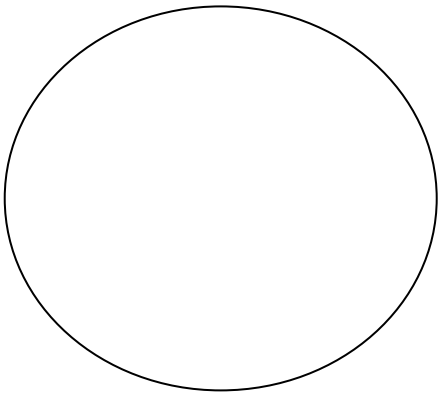


Using high power, draw a microscopic view of the **small intestine (duodenum)** and label the:

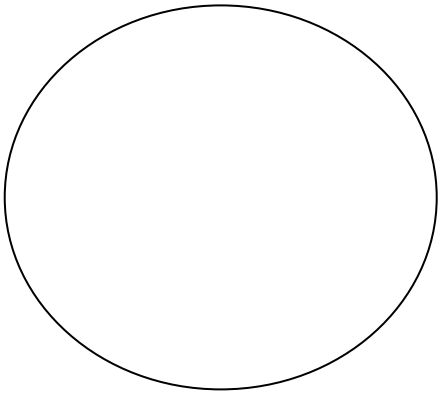
mucosa
- lamina propria
- muscularis mucosae

submucosa
muscularis externa
- circular layer
- longitudinal layer

serosa
lumen
duodenal glands (of Brunner)
intestinal crypts (of Lieberkuhn)
brush border (microvilli)



Now draw a low power view of the small intestine and label the:
plicae circulares (Note how these differ in different regions of the small intestine)
Peyer's patches
Villi (Note how these differ in different regions of the small intestine)
(central) lacteals

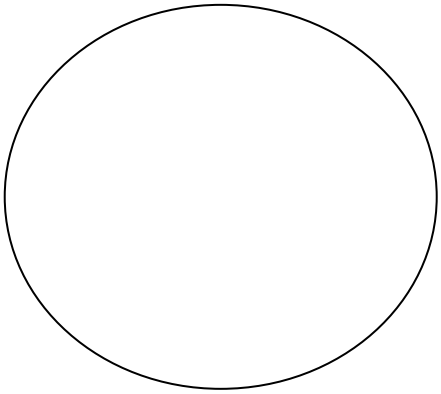


On a slide of the **large intestine (colon)** draw and label the:

mucosa
- lamina propria
- muscularis mucosae

submucosa
muscularis externa
- circular layer
- longitudinal layer

serosa



NOTE: Prior to next week's lab, complete PhysioEx Exercise 39B (Chemical and Physical Processes of Digestion: Computer Simulation), Activities 1-4, found on p. PEx-125.

REFER TO P. 599 OF YOUR LAB MANUAL FOR AN OVERVIEW OF ANATOMICAL LOCATIONS AND ACTIONS OF SPECIFIC ENZYMES.

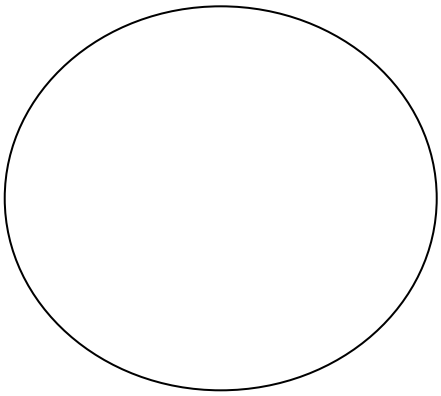
Bring the completed lab manual and the required printouts to lab next week. Complete the appropriate parts of the Review Sheet for Exercise 39B.

Complete the appropriate parts of the Review Sheet for Ex 38.

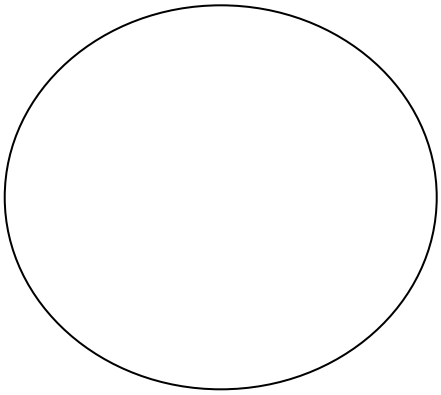
Lab 10: Exercise 38 (cont.) (Anatomy of the Digestive System)
Exercise 39B (Chemical and Physical Processes of Digestion)
Exercise 40 (Anatomy of the Urinary System)
Dissection Exercises 6, 7, and 8 (Respiratory, Digestive, and Urinary Systems of the Cat)

Exercise 38 (cont.)

On a slide of the **liver** draw and label:
lobule
bile canaliculi
central vein
hepatocytes (parenchymal cells)
sinusoids
interlobular space
portal triad
- bile duct
- branch of hepatic artery
- branch of hepatic portal vein



On a slide of the **pancreas** draw and label:
acinar cells
acinar ducts
pancreatic islets (islets of Langerhans)



Exercise 39B (Chemical and Physical Process of Digestion)

Your instructor will review the results of the simulation with you.

Exercise 40 (Anatomy of the Urinary System)

ANATOMY OF THE URINARY SYSTEM: p. 609

On models and manikins, identify the following structures:

Kidney

renal artery and vein
arcuate artery and vein
renal capsule
hilus
pelvis
calyces (major calyx, minor calyx)
cortex
renal column
medulla
renal pyramid
renal papilla
nephron
cortical nephron
juxtamedullary nephron

Ureter, bladder and urethra

ureter
urinary bladder
    rugae
    trigone
    detrusor muscle
urethra
    (male: prostatic, membranous, penile)
    urethral sphincter (internal; external)
    external urethral orifice

Cat Dissection Exercises 6, 7, and 8 (Respiratory, Digestive and Urinary Systems of the Cat)

larynx	thyroid cartilage
cricoid cartilage	epiglottis
thymus	heart
lungs	lobes of the lungs
trachea/tracheal rings	primary bronchi
pleural cavities	mediastinum
diaphragm	phrenic nerve
liver	gall bladder
stomach	greater and lesser curvatures
spleen	pancreas
small intestine	mesentery
large intestine	kidneys
ureters	urinary bladder

Complete the appropriate parts of the Review Sheets for Exercises 38 and 40, as well as Dissection Exercises 6, 7, and 8.

Lab 11: Exercise 40 (Anatomy of the Urinary System, cont.)
Exercise 41A (Urinalysis)

NOTE: For urinalysis exercise, you should consider obtaining a urine sample at the beginning of lab.

Exercise 40

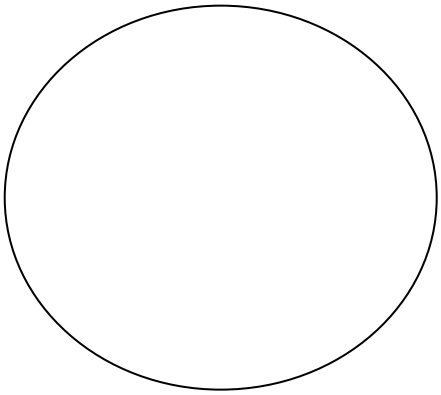
MICROSCOPIC ANATOMY OF THE KIDNEY AND BLADDER: p. 613
On models, manikins, and tissue sections, identify the following structures:

<u>Nephron structures</u>
afferent and efferent arterioles
peritubular capillaries
vasa recta
glomerular capsule (Bowman's capsule)
glomerulus
podocyte
juxtaglomerular apparatus
macula densa

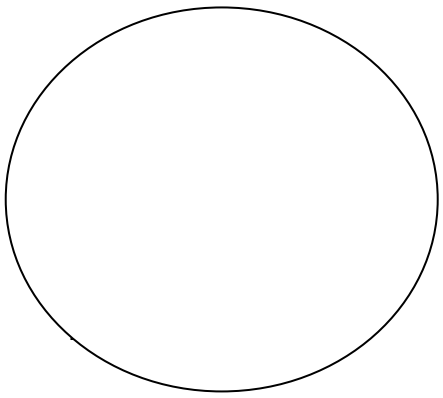
proximal convoluted tubule
loop of Henle
- ascending limb of loop of Henle
- descending limb of loop of Henle

distal convoluted tubule
collecting duct

On slides of the **kidney** draw and label:
- arterioles
- glomerular capsule
  - parietal layer
  - lumen
  - visceral layer
- glomerulus
- renal tubule



On slides of the **bladder** draw and label:
- detrusor muscle
- transitional epithelium of the mucosa



Dissection of the pig/sheep kidney: Identify

renal capsule
cortex
renal columns
medulla
renal pyramids
renal papilla
renal pelvis
major and minor calyces
ureter

Exercise 41A

URINALYSIS: p.621
You will use Multistix for determining the organic constituents of urine and chemical methods for determining the inorganic constituents. You will determine the specific gravity of your urine with a urinometer.

NOTE: Complete Exercise 47 (Acid-Base Balance: Computer Simulation) on p. PEx-153 prior to coming to lab next week. Bring the completed lab manual and the required printouts to lab next week.

Complete the appropriate parts of the Review Sheets for Ex 40 and 41A.

Lab 12: Exercise 47 (Acid-Base Balance)
Exercise 42 (Gross Anatomy of the Male and Female Reproductive Systems)
Cat Dissection Exercise 9 (Reproductive System of the Cat)

Exercise 47 (Acid-Base Balance)
Your instructor will review the results of the simulation with you.

Buffer - a chemical that combines with both acids and bases to minimize pH change
- combine with excess H^+ and OH^-
- may be intracellular or extracellular

Bicarbonate buffer system:
$CO_2 + H_2O \rightarrow H_2CO_3 \rightarrow H^+ + HCO^-_3$

Respiratory component	Renal component
slower breathing	to decrease H^+ :
-retention of CO_2	-secrete more H^+
-production of acid	-reabsorb more HCO_3^-
-acidosis	-corrects acidosis
faster breathing	to increase H^+ :
-eliminate more CO_2	-secrete less H^+ (eliminate more K^+ instead)
-eliminates acid	-reabsorb less HCO_3^- (retain Cl^- instead)
-alkalosis	-corrects alkalosis

BODY FLUIDS:

I. Intracellular fluids (ICF) - found inside cells; 2/3 of body fluids

II. Extracellular fluids (ECF) - found outside cells; 1/3 of body fluids
- A. plasma
  - inside blood vessels, bathes blood cells
  - also lymphatic fluid
- B. interstitial fluid
  - outside blood vessels, bathes body cells

Water movement between compartments:
when extracellular fluid is more concentrated (more solutes) than fluid in cells, then water moves out of cells.
when extracellular fluid is less concentrated than fluid in cells, then water moves into cells

BODY FLUIDS (cont.):

Kidney mechanisms for BP and fluid balance
- low BP in glomerulus results in
  - decreased filtration
  - decreased urine output
- low BP entering glomerulus also results in
  - release of renin
  - aldosterone secretion
  - retention of Na^+ and water

Effect of ADH on kidney function
- when ADH is absent
  - kidney tubule is impermeable
  - water is lost in urine
- when ADH is present
  - kidney tubule is permeable
  - water is reabsorbed

Fluid retention is caused by excesses of
- ADH
- aldosterone
- glucocorticoids

ACID-BASE BALANCE AND BODY FLUIDS WORKSHEET

Answer the following questions.

1. A buffer is a chemical that can combine with or release _____ to minimize changes in _____.

2. In the bicarbonate buffer system equation
$CO_2 + H_2O \rightarrow H_2CO_3 \rightarrow H^+ + HCO_3^-$
which part of the equation is the respiratory component and which is the renal component? _____, _____.

3. During slower breathing, _____ is retained, which produces a condition called _____.

4. Faster breathing eliminates more _____ and leads to a condition called _____.

5. The kidneys correct acidosis by secreting more _____ and reabsorbing/generating more _____.

6. The kidneys correct alkalosis by secreting less _____ and by reabsorbing less _____.

7. Intracellular fluids (ICF) are found _____ _____ and constitute 2/3 of body fluids.

8. Extracellular fluids (ECF) are found _____ _____ and constitute 1/3 of body fluids.

9. Extracellular fluids include _____, which is found inside blood vessels, and _____ _____, which is found outside blood vessels and bathes body cells.

11. When extracellular fluid is more concentrated (more solutes) than fluid inside cells, water moves _____ cells.

12. When extracellular fluid is less concentrated than fluid in cells, then water moves _____ cells.

13. Low blood pressure (BP) in the glomerulus of the kidney results in _____ filtration and _____ urine output.

14. Low BP entering the glomerulus also results in the release of _____, which in turn causes the release of _____ by the adrenal cortex. This then results in the retention of ____ and _____, which increases BP.

15. When ADH (antidiuretic hormone) is absent, the kidney tubules are _____ and water is _____.

16. When ADH is present, the kidney tubules are _____ and water is _____.

17. Fluid retention is caused by excesses of _____, _____, and _____.

Exercise 42

GROSS ANATOMY OF THE MALE REPRODUCTIVE SYSTEM: p. 629

On models and manikins, identify:
scrotum
testis
rete testis
epididymis
efferent ductule
spermatic cord
ductus (vas) deferens
seminal vesicle
ejaculatory duct
prostate gland
urethra
    prostatic
    membranous
    penile
bulbourethral (Cowper's) glands
penis
    glans
    prepuce
    shaft
    corpus cavernosum
    corpus spongiosum
    dorsal vein

GROSS ANATOMY OF THE **FEMALE** REPRODUCTIVE SYSTEM: p. 633

On models and manikins, identify:
ovary
suspensory ligament of ovary
uterine tube
fimbriae
uterus
    cervix
    body
    fundus
    rugae
    endometrium
    myometrium
    perimetrìum
broad ligament
round ligament of uterus

vagina
    vaginal orifice
    vestibular gland
    vestibule
hymen
urethral orifice
clitoris, prepuce
labia majora
labia minora
mons pubis
perineum

mammary gland
    alveolus, lactiferous duct, lactiferous sinus
    areola
    nipple

Cat Dissection Exercise 9

penis	vagina
scrotum	uterine body
testes	uterine horns
ductus deferens	ovaries

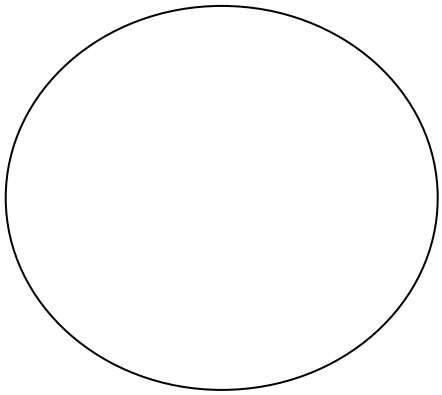
Complete the appropriate parts of the Review Sheet for Exercises 42 and 47, and Dissection Exercise 9.

Lab 13: Exercise 43 (Reproductive Physiology and Gametogenesis)

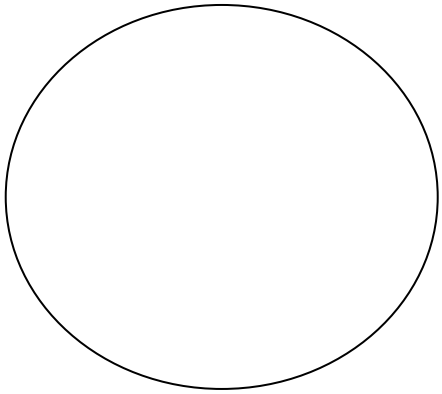
Meiosis (see handout):
- Gametogenesis
  - Spermatogenesis
  - Oogenesis

On slides of the **testis**, draw and label:
interstitial (Leydig) cell
seminiferous tubule
- lumen, spermatogonia, spermatocytes, sperm

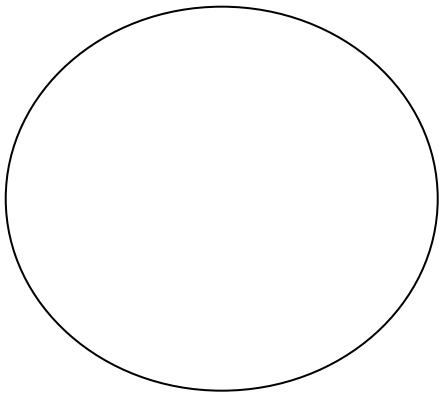
tunica albuginea



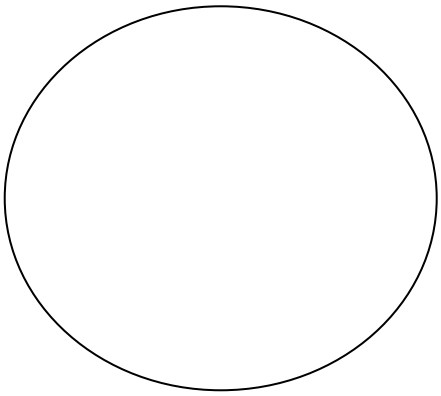
On slides of the **epididymis**, draw and label:
lumen
epithelial lining
smooth muscle layer



On slides of the **penis**, draw and label:
urethra
corpus cavernosum
corpus spongiosum

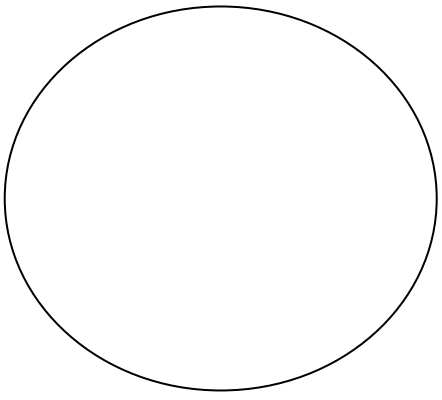


On slides of **sperm**, draw and label:
acrosome
head
midpiece
tail



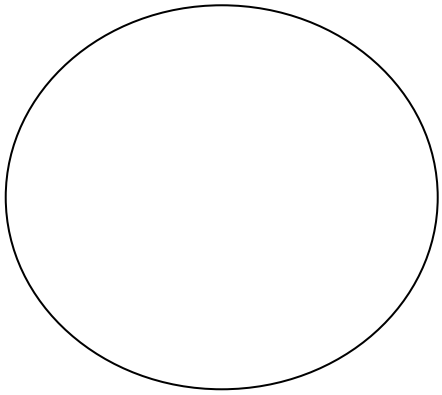
Using a model of the **ovary**, identify:
tunica albuginea
follicles:
primordial
primary
secondary (growing),
vesicular (Graafian) follicle
- antrum,
- corona radiata
- granulosa cell
- oocyte

Using slides of the **ovary**, draw and label a primary follicle, secondary follicle, mature follicle, corpus luteum, and corpus albicans.



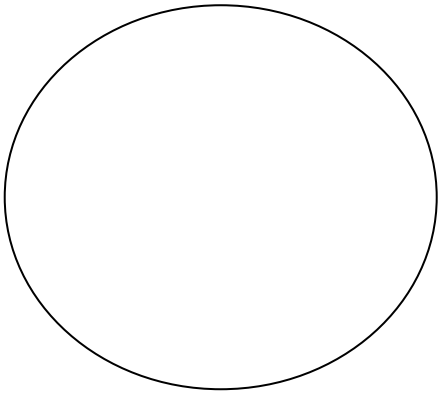
Using a model of the uterus, identify:
myometrium,
endometrium
    stratum functionalis
    stratum basalis

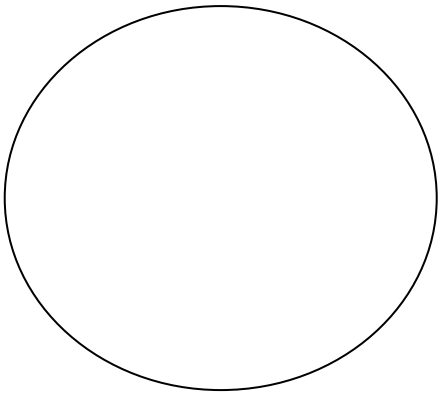
Using slides of the **uterus**, draw and label the stratum basale, stratum functionalis, myometrium, blood vessels, glands.

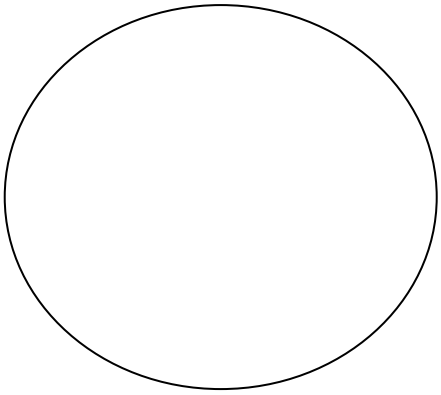


Also identify and draw the following endometrial stages:

menstrual stage
secretory (progravid) stage
proliferative (ischemic) stage







Complete the appropriate sections of the Review Sheet for Exercise 43.

Lab 14: Lab Exam 2

APPROXIMATE DISTRIBUTION OF QUESTIONS ON Lab Exam 2.

Digestive system anatomy	10
Digestion lab	6
Urinary system anatomy and physiology	14
Acid-Base and Fluid balance	7
Reproductive system	16
Cat anatomy	7

Lab 15: Development video

Revised Spring 08