Introduction to Dissection:

A valuable learning experience allows students to touch and handle those things with which they are learning about. Anatomy is three-dimensional—it has shape and other qualities that must be touched in order to gain more understanding. Humans, pigs and sheep are all mammals with very similar organizational structure. We will be using animal specimens that are very similar with humans to learn about human anatomy.

Keep in mind, during your dissections, directional terminology is used with the specimen. So in anatomically correct position, a sheep or a pig would be on all four limbs; humans stand erect.

Lab Safety

Wear nonlatex gloves and goggles during all dissections. Exercise caution while using sharp instruments.

In many cases, the specimen we will be using has been preserved in solutions that slow decomposition rates. This allows us to use a specimen throughout an entire semester. As you store your specimen, it is important to keep your specimen moist with the preservative provided.

While the preservative is relatively safe, you are required to wear goggles and nonlatex gloves throughout the dissection. If you should get preservative on your skin, please wash with soap and water. Always wash your hands, with soap, once you have completed your dissection activities before you leave the lab environment.

All students are required to perform dissection activities. All students are required to be gloved and goggled. All students will take turns performing different dissection activities on (usually) a shared specimen. As you perform your dissections and exploration into the specimen you are going to gain a true appreciation for how tough some parts are, how connective tissue is truly the most abundant tissue, etc.!

Dissections require the use of razor blades, scalpels, scissors and/or sharp probes. Handle these items carefully. If at any time you cut yourself, immediately wash with soap and water. Inform your instructor. We have a first aid kit available and will provide band aids as needed.

Biohazard

All students are required to wash their hands, tools and bench with soap and water after they have completed the dissection activities. Razor blades are always disposed of in the biohazard container.

Used razor blades and scalpel blades must be disposed of in the biohazard container.

It is important that you keep your area and tools clean and dry. After each dissection activity, wash your tools and table top (bench) with soap and water as provided. When you arrive to your seat/leave your area, it should be clean and dry. Report any spills to your instructor.

The computers in lab are available and you may use the photoalbums through the course site during your dissection activities to aid you in identifications. Please keep the keyboard and mouse clean and dry. A few extra paper towels at your bench or an extra nonlatex glove covering the computer mouse should be adequate.

In addition to the preservative, your fetal pig specimen’s blood vessels have been injected with latex in order to more easily identify them once we have accessed the internal cavities. The arteries have been injected with red latex and (in some cases, the veins have been injected with blue latex.)

Specimen: Fetal Pig (1 specimen per pair of students)

Materials: dissection tray, blunt probe, sharp probe, scissors, forceps, razor
Activity 1: External Anatomy

Observe the external structures of your specimen following the procedure described below.

Procedure:

1) Before lab, pay careful attention to the bold faced structures and practice identifying these prior to lab on the photographs provided here or through the Fetal Pig Photoalbum Online.

2) Please wear your goggles and nonlatex gloves throughout the activity.

3) Remove your specimen from its container and place on the dissection tray.

4) Identify the indicated external structures on the ventral surface. Record your observations in your lab notebook.

   a. Look around at several different specimens, do all specimens have nipples?

5) Inferior to the tail is the anus. This is an external opening. Inferior to the anus, structures can be used to identify the gender of your specimen.

   a. The male has a scrotal sac containing the testes. The penis is internal and cannot be viewed externally. Follow the midline from the scrotal sac towards the umbilical cord on the ventral surface. Identify the urogenital opening on the male.

   b. The female has a cone shaped projection, the urogenital papilla inferior to the anus. There is an opening, the urogenital opening located within the papilla. Both the vagina and the urethra open into the urogenital opening before reaching the external environment.

6) Students are encouraged to observe the structures on both sexes.

7) Record your observations and complete the associated questions in your lab notebook.
Activity 2: Dissection of the Abdominopelvic Cavity

In order to view the organs and spaces of the abdominal and pelvic cavities, we will be cutting through the abdominal wall along the midline and extending the cuts laterally—along the diaphragm and again laterally along the abdominopelvic wall (see diagram below). The only bones that may be cut during this dissection are the costals (ribs) which can be made easily with the scissors. The abdominal cavity fills with preservative during storage, so care needs to be taken when penetrating into the abdominal cavity.

Your instructor may modify dissection steps, so please pay careful attention to the description provided before beginning your dissection.

Lab Safety
Wear nonlatex gloves and goggles during all dissections.
Use caution while working with razor blades and/or scalpels.
As you open the abdominopelvic cavity, the cavity tends to be filled with preservative, if any gets on your skin wash with soap and water.

Procedure

1) Beginning along the midline, anterior to the umbilical cord, use a razor to cut through the abdominal wall. When you have entered into the abdominal cavity, there will be some leakage of preservative from the cavity. Roll the specimen on its side and allow the excess preservative to drain out onto the dissection tray. (You may pour the excess from the dissection tray down the drain in the lab).

2) The midline cut should be large enough for you to place one finger into the abdominal cavity and feel the thickness of the abdominal wall. Gently poke your finger anteriorly and about where the ribs are, the diaphragm (muscle) separates the abdominal and thoracic cavity. Continue your cut along the midline anteriorly to the diaphragm.

3) At the diaphragm, palpate the thoracic wall and feel where the costals (ribs) mark the posterior border of the thoracic cavity. Continue cutting through the abdominal wall laterally.

4) To expose a portion of the pelvic cavity, begin again at the midline, and cut laterally along the line of the nipples to the groin. From the groin cut the abdominal wall laterally on both sides.
5) You may need to cut the umbilical vein to move the flap of skin with the umbilical cord inferiorly toward the hindlimbs of the specimen.

6) Once you have exposed the abdominopelvic organs, identify the following structures (your instructor may have you continue your dissections through other areas and then return to these identifications):

   a) **peritoneum**: thin membrane that lines the walls of the abdominal cavity.

   b) **liver**: large brown organ posterior to the diaphragm

   c) **gallbladder**: small green-black organ that lies between the lobes of the liver on the specimen's right side. The gallbladder stores bile produced by the liver and releases it through a duct, **common bile duct**, into the duodenum.

   d) **spleen**: finger-like dark red organ that lies over the greater curvature of the stomach. The spleen functions as a lymphatic organ to cleanse the blood.
7) **stomach**: large pouch, often filled with preservative. The stomach has several different parts that can be identified on the specimen.
   a) **cardiac sphincter** at the junction of the esophagus and stomach along the dorsal wall. The cardiac sphincter is a circular muscle that prevents the contents of the stomach from entering back into the esophagus.
   b) **cardiac region**: small area of the stomach adjacent to the cardiac sphincter.
   c) **body** and **fundus** of the stomach: large pouch of the stomach
   d) **pyloric sphincter**: circular muscle at the junction of the stomach and the duodenum of the small intestine. Rub this region between your fingers to feel the muscular pyloric sphincter.
   e) **pyloric region**: area of the stomach adjacent to the pyloric sphincter
   f) **greater curvature**: long curve of the ventral portion of the stomach from sphincter to sphincter.
   g) **lesser curvature**: short curve of the dorsal portion of the stomach from sphincter to sphincter.

8) **pancreas**: gland that lies dorsal to the stomach (lift the stomach) responsible for the production of insulin and enzymes that digest food as it travels through the intestines.

9) **small intestine**: The small intestine is a very long tube that is highly oiled and held in position by the mesentery (membrane). The small intestine has several distinct regions:
   a) **duodenum**: proximal to the stomach
   b) **jejunum**: middle portion of the small intestine
   c) **ileum**: distal portion of the intestine attached to the large intestine.
   d) gently spread the small intestine with your fingers to view the transparent **mesentery** (membrane). There are many red arteries that bring blood to the intestines to pick up nutrients from food for distribution.
e) **large intestine**: the large intestine is held together much more tightly than the small intestine. Where the small intestine enters into the large intestine, a pouch extends from the large intestine, the **cecum**. This where the human appendix is attached. The most posterior section of the large intestine is the **rectum** that lies along the dorsal abdominal wall and terminates the anus to the external environment.

f) **Kidneys**: The kidneys are retroperitoneal, that is they lie dorsal to the peritoneum so the peritoneal membrane must be broken in order to expose the kidneys. As you gently transect the peritoneum watch for the ureters, clear kinky tubes that extend from the kidney to the urinary bladder.

g) **Umbilical arteries**: There are two umbilical arteries filled with red latex that are associated with the flap of skin with the umbilical cord.

h) **Urinary bladder**: the bladder, often empty in the fetal pig lies between the umbilical arteries.

i) At the base of the urinary bladder are the reproductive organs. You may see the **vas deferens** (tubes) of the male or you may see the **uterine horns** with tiny **ovaries** attached to each horn. Preserve these structures for later dissections.

10) Record your dissection steps, observations and answer the questions in your lab notebook.
Activity 3: Dissection of the Thoracic Cavity and Neck Region

In order to view the thoracic cavity, the sternum must be cut. As this cut is performed, the heart and several major blood vessels lie just dorsally to the sternum. It is important that the sternum be cut without damaging the heart or blood vessels. We will then continue the incision through the skin and muscle of the neck to view the neck anatomy.

Your instructor may modify dissection steps, so please pay careful attention to the description provided before beginning your dissection.

Lab Safety Wear nonlatex gloves and goggles during all dissections. Use caution while working with razor blades and/or scalpels. Wash with soap and water if you get any preservative on your skin.

Procedure: Dissection and Anatomy of the Thoracic Cavity

1) Gently palpate, press to find the posterior edge of the costals (ribs). Cut through the wall of the thoracic cavity carefully and extend the cuts laterally to the axillary region of your specimen.

2) Along the midline, blunt edge against the viscera (organs), use your scissors to cut along the sternum anteriorly through the manubrium (anterior portion of the sternum).

3) Continue, with your scissors, blunt side down, and cut laterally to the acromion (shoulder)

4) The heart lies within the pericardial sac, composed of tough fibrous connective tissue. The pericardial sac is attached to the dorsal wall of the sternum. Carefully cut the pericardial sac so the heart remains within the thoracic cavity as you bend the thoracic walls laterally exposing the organs of the thoracic cavity.

5) Identify the following structures:
   a. Pleural membranes: thin serous membranes that decrease friction by covering the lungs and lining the thoracic cavity.
   b. Pleural Cavity: space within the thoracic cavity where the lungs are located.
   c. Lungs: there are 4 lobes on the right and 3 lobes on the left of the pig. Humans have 3 and 2 lobes respectively. Pigs, and other mammals, that have longer thoracic regions have more space to house more lobes.
   d. Pericardial cavity: space within the thoracic cavity where the heart is located.
   e. Thymus gland: diffuse gland that lies on the superior portion of the heart (it is also found in the neck region).
   f. Pericardium or pericardial sac: somewhat transparent tough fibrous membrane that surrounds the heart. Cut an opening through the pericardium to view the heart itself—be sure to save a portion of the pericardial sac attached to the superior part of the heart.
   g. Heart: dense muscular organ that contracts or beats moving the blood through blood vessels (arteries).
      (1) coronary vessels: blood vessels on the surface of the heart that serve the heart muscle as it pumps.
      (2) right and left ventricles: posterior chambers of the heart
      (3) apex: point of the heart, most point towards the left of the specimen
      (4) right and left auricles or atria: superior chambers of the heart that are thinner walled than the ventricles.

6) Record your dissection steps, observations and answers to the questions in your lab notebook.
Procedure: Dissection and Anatomy of the Neck Region

1) The skin includes the epidermis and dermis overlaying the subcutaneous (adipose) layer. Using your blunt probe, gently push the blunt probe through the subcutaneous layer from the midline at the manubrium to the midline of the mandible.

2) Use your scissors or razor blade to cut through the skin and peel the skin back.

3) There are several thin muscles (bands of skeletal muscle tissue) that must be removed in order to view the deeper structures of the neck.

4) Identify the following structures on your specimen:

   a. **Larynx**: (voicebox) part of the respiratory system which produces vocal sounds. The larynx is composed of hyaline cartilage and easily felt by pressing on the neck region.

   b. **Thymus gland**: There are two thymus glands located laterally to the trachea. The thymus gland produces hormones that aid in T-cell maturation. Gently push the thymus glands laterally to better view the trachea.

   c. **Thyroid gland**: this endocrine gland is small, oval and dark lying atop the trachea near the manubrium of the sternum

   d. **Trachea**: the conduit that carries air between the larynx and the lungs. Follow the larynx caudally (toward the tail). The trachea has C-shaped cartilaginous rings which give it a striped appearance.

   e. **Esophagus**: the esophagus carries food mixed with saliva (bolus) from the oral cavity to the stomach. The esophagus is a collapsed muscular tube, only expanding when food is passed through. Locate the esophagus dorsal to the trachea. You may need to gently break the connective tissue that holds the trachea and esophagus together.

5) Record your dissection steps, observations and answer the questions in your lab notebook.
Activity 4: Specimen Storage

Biohazard
All students are required to wash their hands, tools and bench with soap and water after they have completed the dissection activities. Razor blades are always disposed of in the biohazard container.

Once you have completed your dissection procedures, return the specimen to the Ziploc plastic bag containing the excess preservative.

Make sure to close the bag securely to prevent the preservative from leaking out of the bag. The preservative only works if it keeps your specimen in contact with the preservative and remains moist with preservative.

Make sure that you have properly labeled the bag/container so that you can easily retrieve your specimen during future dissection activities.

Place the specimen in the storage area described/provided by your instructor.

Any used razor blades are to be disposed of in the red plastic biohazard containers.

Wash the dissection tray and dissection tools with soap and water.

Return your goggles.

Dry all equipment.

Dispose of your nonlatex gloves in the trash receptacles.

Wash your hands with soap and water.