

ANATOMY AND PHYSIOLOGY

CAT DISSECTION UNIT

INTRODUCTION

To conclude our study of anatomy and physiology, we will dissect a cat in a ___ day unit lesson. Through this dissection we will be able to observe all of the systems we have discussed in class. The cat is chosen for this unit because of its anatomy is similar to that of humans, and its size makes it easy to observe and dissect. There are several things that you must keep in mind to be successful in this dissection:

1. Read all directions carefully before you dissect. You cannot “take back” a cut made with your scalpel. Be sure you know what you are cutting before you cut. Care should be taken not to destroy delicate structures during the first stages of your work.
2. Do not ask questions that can be answered by reading the directions. If you are unable to find a structure after exhausting all of your resources, then call on your teacher for assistance.
3. There may be some variation in the arrangement of blood vessels within your cat when compared to the diagrams provided. Drawings show the usual locations of these vessels. It may help to trace the path of known vessels when trying to identify others.
4. Pay careful attention to any instructions given by your teacher during the dissection. Some directions may be changed, and your grade will be penalized for not following instructions.
5. At the beginning of every period, it is your group’s responsibility to gather the necessary materials. At the end of the period, it is your group’s responsibility to clean up and put away materials correctly. You must have your materials sheet signed by your teacher every day to receive credit for following directions.
6. If there is an accident or injury in class, you must notify the teacher immediately. All other general lab safety rules must be followed.
7. All group members must wear the appropriate safety equipment at all times. This includes aprons, goggles, and gloves. Points will be deducted for each violation of this important safety rule.

MATERIALS

Each group will have a dissection tool kit that will contain the following tools:

1. scalpel
2. blunt tip scissors
3. pointed tip scissors
4. 2 dissecting needles (one straight end, one angled)
5. forceps
6. pipette
7. dissecting probe
8. small ruler

Each group will also have a dissecting pan and appropriate safety equipment (apron, goggles, and gloves) for all group members. Each group will also receive a dissection lab manual for use in class.

At the end of each period, the materials manager for your group must have your materials cleaned and put away in the appropriate place in the classroom. The materials manager must also get the teacher's signature on your group materials sheet.

Cats will be stored in their bags in the box on the lab table. You may wish to mist your cat with water and cover with a damp paper towel before placing it in the bag to prevent it from drying out. Dissection tool kits will be stored in the labeled box on the lab table. All safety equipment will be returned neatly to its appropriate box. All used gloves and paper towels must be placed in the trash, and desks should be wiped down with cleaning solution. Dissection lab manuals will be neatly stacked on the lab table.

GROUP ROLES

Each group will consist of 5-6 members. Each member will have an assigned role. Roles will be rotated on a daily basis to ensure that all members get to participate fully in the dissection. The roles and responsibilities are as follows:

1. **Group Manager** – responsible for keeping the group on task and giving directions; may assist other group members with their responsibilities if needed
2. **Dissector** (2) – responsible for the actual dissection of the cat
3. **Materials Manager** (1-2) – responsible for picking up, cleaning, and turning in all lab materials
4. **Recorder** – responsible for writing the daily lab report

If a group member is absent, it is the responsibility of the other group members to divide up the duties and responsibilities of that member. Roles and any absences should be documented daily in the group's lab report.

DIRECTIONAL TERMS

The most common directional terms used during this dissection are: cranial, caudal, dorsal, ventral, distal, and medial. Cranial and caudal are used instead of anterior and posterior. Refer to your notes from the beginning of the year if you do not recognize a directional term.

DAILY PROCEDURE

Each day there will be a copy of the day's lab instructions on the overhead. Once the material manager arrives in the classroom, all materials for the period should be collected and placed at the group's station. All bags and books should be placed under desks to prevent accidents. Once the tardy bell rings, pre-lab instructions will be given. During this time, your teacher will go over the day's lab instructions, making any necessary changes. This is the appropriate time to ask for clarification regarding the day's activities. After the pre-lab instructional period, each group will begin working on the cats. There is no reason for students to move around the room, unless they are fulfilling their role responsibilities. If you need assistance from the teacher, raise your hand and wait patiently. If your group should finish the day's activities early, you should spend the remainder of the period reviewing for your final exam. When there are 5

minutes remaining in the period, you will be instructed to begin clean-up procedures. The group should not leave the classroom without completing all clean-up procedures. The daily lab report should be turned in by the end of the period.

LAB REPORT FORMAT

Each day your group will turn in a brief lab report of the day's activities. The group's recorder is responsible for completing this part of the lab. All reports should be legible and have the following format:

1. **Group member roles** – note any absences
2. **Objectives**
3. **Procedure and observations** – **BE DETAILED!**
4. **Questions** – answer any analysis questions given with lab instruction sheets

MATERIALS SHEET

Group Members: _____

Day 1: _____

Manager: _____

Pan _____
Tools _____
Cat _____
Manual _____
Area _____

Day 6: _____

Manager: _____

Pan _____
Tools _____
Cat _____
Manual _____
Area _____

Day 2: _____

Manager: _____

Pan _____
Tools _____
Cat _____
Manual _____
Area _____

Day 7: _____

Manager: _____

Pan _____
Tools _____
Cat _____
Manual _____
Area _____

Day 3: _____

Manager: _____

Pan _____
Tools _____
Cat _____
Manual _____
Area _____

Day 8: _____

Manager: _____

Pan _____
Tools _____
Cat _____
Manual _____
Area _____

Day 4: _____

Manager: _____

Pan _____
Tools _____
Cat _____
Manual _____
Area _____

Day 9: _____

Manager: _____

Pan _____
Tools _____
Cat _____
Manual _____
Area _____

Day 5: _____

Manager: _____

Pan _____
Tools _____
Cat _____
Manual _____
Area _____

Day 10: _____

Manager: _____

Pan _____
Tools _____
Cat _____
Manual _____
Area _____

ANATOMY AND PHYSIOLOGY

CAT DISSECTION – DAY ONE

Objectives:

1. Observe external anatomical features.
2. Compare and contrast the cat and human skeletons.
3. Compare and contrast cat and human dentition.

Procedure:

1. Place your cat ventral side up. Review planes of symmetry and directional terms.
 2. Look over the external anatomy of your cat, and locate and examine the following structures:
 - Head, including eyes and eyelids; pinnae (external ear structures); mouth; nares (nostrils); philtrum (cleft in upper lip); and vibrissae (long, stiff hairs around the mouth, cheeks, and eyes)
 - Neck
 - Trunk, including mammillary papillae (teats); anus; urogenital opening or scrotum and penis; and tail
 - Forelimbs, including shoulders; elbows; wrists; feet; toes; claws; and tori (foot pads)
 - Hind limbs, including hips; knees; ankles; feet; toes; claws; and tori (foot pads)
 - Separate the upper and lower eyelids. Locate and examine the third eyelid, the nictitating membrane.
- *Be sure to include detailed observations in your daily lab report.*
1. Look at the drawing of the cat skeleton. Note differences between the human and cat skeletons in your lab report. Also note any differences in articulations.
 2. Open your cat's mouth and look at the teeth. Count the number of incisors, canines, premolars, and molars found on the upper and lower jaws. Record this information in your lab report.
 3. Using page 17 of your lab guide, skin your cat, being very careful not to damage underlying tissue.
Remember: there is more than one way to skin a cat (but this is the way we are doing it!)

Analysis Questions:

1. What sensory modifications are found on the cat's head?
2. What is the purpose of the thick pads on the cat's feet?
3. List 5 differences between the cat skeleton and the human skeleton.
4. Explain why the cat girdles are different from human girdles.
5. How does the cat's dentition compare to human dentition.
6. Do you think your cat is male or female?

ANATOMY AND PHYSIOLOGY

CAT DISSECTION – DAY TWO

Objectives:

1. Identify major muscles of the cat.
2. Observe the actions of major muscles.
3. Compare and contrast the cat and human musculature.

Procedure:

1. Your cat should already be skinned, but you may find it necessary to use your forceps to remove some fat and connective tissue. Be careful not to tear blood vessels, nerves, or muscles.
2. Using the gastrocnemius of your cat, review the following muscle terminology:
 - a. head
 - b. Tendon
 - c. fascia
 - d. insertion
 - e. fascicule
 - f. origin
 - g. perimysium
 - h. aponeurosis (look at the abdomen)
3. Pull the insertion toward the origin to observe the action of the muscle.
4. On one side of your cat, locate and dissect the muscles listed below. The muscles are grouped according to region. Some deep muscles may require that you transect and reflect the superficial muscle. **MAKE SURE YOU KNOW WHAT YOU ARE CUTTING!** As you identify muscles, move the insertion toward the origin to note the muscle actions.

Chest Muscles: (19)

Pectoralis major
Pectoralis minor

Abdominal Muscles: (35-36)

External oblique
Internal oblique
Transversus abdominis
Rectus abdominis

Neck Muscles: (20)

Sternomastoid
Masseter
Temporalis

Shoulder Muscles: (21-23)

Acromiodeltoid
Trapezius muscles
Latissimus dorsi

Back Muscles: (28)

Serratus muscles

Forearm Muscles: (19-26)

Biceps brachii
Triceps brachii
Brachioradialis
Brachialis
Pronator teres

Hindlimb Muscles: (30-34)

Gluteus medius
Tensor fascia lata
Gluteus maximus
Biceps femoris
Vastus lateralis
Semimembranosus
Semitendinosus
Sartorius
Gracilis
Vastus medialis
Gastrocnemius
Soleus
Peroneus
Tibialis anterior

Analysis Questions:

1. Name the type of muscle tissue found in the muscles you identified.
2. What are the criteria used to name muscles?
3. Identify the actions of the following muscles:
 - Masseter
 - Gracilis
 - Triceps brachii
 - Biceps brachii
 - Gastrocnemius
 - Rectus abdominis
4. List 3 differences between human musculature and cat musculature.

ANATOMY AND PHYSIOLOGY CAT DISSECTION – DAY THREE

Objectives:

1. Examine the digestive structures of the mouth.
2. Compare and contrast human and cat mouth structures.
3. Examine the digestive structures of the throat and thorax.

Procedure:

1. To skin the head, make an incision from the left side of the lower lip, up to the top of the left eye, across to the top of the right eye, and down to the right side of the lower lip. Remove the skin from the head, cutting around the bases of the ears as you come to them.
2. Using the right side of your cat's head, locate the following salivary glands, indicating their locations in your lab report:
 - parotid gland
 - submandibular gland
 - sublingual gland
 - molar gland
 - infraorbital gland

Do not confuse salivary glands with lymph nodes – lymph nodes are smooth; salivary glands have lobulated surfaces. You may find it necessary to remove the lymph node found below the submandibular gland to observe the entire structure.
3. Cut through the muscles and skin at the corners of the mouth, then press down the lower jaws with your fingers. Cut the angle of the mandible to observe the following structures:

a. lips	h. filiform papillae	o. soft palate
b. cheeks	i. fungiform papillae	p. palatine tonsils
c. vestibule	j. larynx	q. epiglottis
d. oral cavity	k. vallate papillae	r. pharynx
e. teeth (review them)	l. esophagus	s. glottis
f. tongue	m. foliate papillae	t. Eustachian tube
g. frenulum	n. hard palate	
4. Open the abdominal and thoracic cavities with the blunt tip scissors by cutting through the body wall just to the right of the midventral line from the clavicle to the anus. When cutting, insert the blunt tip of your scissors through the muscular wall and keep the sharp tip outside the body. Be careful to avoid cutting any internal membranes or organs.
5. In the thoracic region, make sure you cut through the cartilage of the ribs on the right side. **DO NOT ATTEMPT TO SPLIT THE STERNUM.**
 - Break or cut each rib on the right side near its vertebral articulation. Make lateral incisions where needed, then deflect the body wall to the right to expose the underlying structures.
6. **Do NOT make any other cuts or remove any structures until your teacher tells you.**
7. Transect and reflect the digastric, mylohyoid, and geniohyoid muscles to expose the structures of the throat. Observe the pharynx and esophagus.

Analysis Questions:

1. What are the major functions of the salivary glands?
2. Describe the 5 types of papillae found on the cat's tongue. What do you think is the purpose of the papillae?
3. Which bones form the hard palate?
4. Compare and contrast the human and cat mouth and throat structures.

ANATOMY AND PHYSIOLOGY CAT DISSECTION – DAY FOUR

Objectives:

1. Observe the digestive structures of the cat.
2. Examine the internal anatomy of cat digestive organs.

Procedure:

1. There may be large amounts of dried blood within the abdominal cavity of your cat. You may wish to carefully rinse the organs of the abdominal cavity. Once you can see the abdominal structures, locate and identify the following:
 - a. esophagus
 - b. peritoneum
 - c. greater omentum
 - d. lesser omentum
 - e. mesentery
 - f. liver
 - g. gallbladder
 - h. stomach
 - i. spleen
 - j. small intestine
 - k. large intestine
 - l. pancreas
2. You will now observe some of the above structures in more detail. First look at the region where the esophagus joins the stomach. Feel this region to locate the cardiac sphincter. Slice the stomach open along the greater curvature. Locate the following stomach structures:
 - a. cardiac region
 - b. fundic region
 - c. body
 - d. pyloric region
 - e. pyloric sphincter
 - f. rugae
 - g. greater curvature
 - h. lesser curvature
3. Be careful not to damage the reddish brown spleen that lies near the greater curvature of the stomach.
4. Next you will examine the liver, gallbladder, and pancreas. The liver is the largest abdominal organ. Identify the following structures:
 - a. left lateral and median lobes of liver
 - b. right lateral and median lobes of liver
 - c. falciform ligament
 - d. hepatic duct
 - e. cystic duct
 - f. common bile duct
 - g. pancreatic duct
 - h. hepatopancreatic sphincter
5. To observe the small intestine, you must first reflect the greater omentum, which covers the transverse colon and most of the small intestine. Find the beginning and ending of the small intestine and attempt to uncoil it. Be careful not to tear the mesentery. Using a ruler, measure the length of the small intestine and record this number in your lab report.
6. Using your scalpel, cut open a section of the small intestine, preferably in the jejunum region. Locate the villi that line the intestinal wall. Look out for any parasitic roundworms or tapeworms that may have inhabited your cat.
7. Identify the following structures of the large intestine:
 - a. cecum
 - b. ileocecal valve
 - c. ascending colon
 - d. transverse colon
 - e. descending colon
 - f. rectum
 - g. anus
8. Attempt to locate the internal and external anal sphincters. Be careful not to damage the bladder during your examination of the large intestine.

Analysis Questions:

1. What is the function of the stomach? What anatomical features are related to this function?
2. Why do we not examine the spleen while studying the digestive system? Explain your answer.
3. What are the 3 regions of the small intestine? Can they be identified easily by study of gross anatomy?
4. What is the purpose of the villi in the small intestine?
5. What large intestine structures are found in humans, but not in cats?
6. What is the purpose of the various membranes that surround the digestive organs?

ANATOMY AND PHYSIOLOGY CAT DISSECTION – DAY FIVE

Objectives:

1. Observe and identify structures of the thoracic cavity.
2. Trace the pathway of blood through the pulmonary circuit of the cardiovascular system.
3. Observe and identify the chambers of the heart.
4. Identify major arteries and veins of the cat.

Procedure:

1. If you have not already done so, cut down the sides of the diaphragm. Cut up through the left side of the rib cage just lateral to the sternum. Pull back the rib cage to expose the thoracic cavity. You may need to break the ribs close to the vertebral column.
2. Once you have opened the thoracic cavity, locate the following structures:
 - a. larynx
 - b. trachea
 - c. primary bronchi
 - d. secondary bronchi
 - e. lungs
 - f. thyroid gland
 - g. epiglottis
 - h. thymus gland
3. Locate the cat's heart in the thoracic cavity. Attempt to locate the pericardium that surrounds the heart. You may have to remove this membrane and the thymus gland to observe the heart's anatomy. Locate the following heart structures:
 - a. left ventricle
 - b. right ventricle
 - c. left atrium
 - d. right atrium
 - e. auricles
 - f. apex
 - g. pulmonary arch
 - h. aorta
 - i. superior vena cava
 - j. inferior vena cava
 - k. pulmonary arteries
 - l. pulmonary veins
4. It may be necessary to carefully remove some fat from around the heart to observe the associated blood vessels.
4. To examine heart anatomy in more detail, it is necessary to remove the heart from the thoracic cavity. Cut the pulmonary arch, inferior vena cava, superior vena cava, and the aorta close to the heart. Use your forceps to remove the latex from the heart.
5. Carefully make an incision through the wall of each atrium, and transversely cut off the apex of the ventricles. Use your forceps to pick out the clotted blood from the heart chambers. Locate the following internal heart structures:
 - a. tricuspid valve
 - b. bicuspid valve
 - c. pulmonary valve
 - d. aortic valve
 - e. chordae tendinae
 - f. papillary muscles
 - g. interventricular septum
5. It may be helpful to use your dissecting probe to feel out valves and vessel openings into the heart.
6. Using your lab manual as a guide, locate the following major veins and arteries:
 - a. left and right subclavian arteries
 - b. left and right common carotid arteries
 - c. external and internal carotid arteries
 - d. external iliac arteries
 - e. external and internal jugular veins
 - f. common iliac vein
 - g. lumbar vein
 - h. hepatic portal vein

Analysis Questions:

1. Where do the branches of the bronchial tree ultimately end?
2. List the steps of the pulmonary circuit of the cardiovascular system starting with the left atrium. Include all valves of the heart.
3. Distinguish between arteries and veins.
4. How are the cardiovascular and respiratory systems connected? Explain your answer.
5. What is the purpose of the cartilage rings of the trachea?
6. List the functions of the larynx.
7. List the structures that make up the pathway of air through the respiratory system starting with the external nares.

ANATOMY AND PHYSIOLOGY CAT DISSECTION – DAY SIX

Objectives:

1. Identify structures of the urinary system.
2. Identify structures of the cat male and female reproductive system.

Procedure:

1. Locate the kidneys. The kidneys are situated on either side of the vertebral column at about the level of the third to fifth lumbar vertebrae. The right kidney is slightly higher than the left. Each is surrounded by a mass of fat called the adipose capsule, which should be removed. Unlike other abdominal organs that are suspended by an extension of the peritoneum, the kidneys are covered by parietal peritoneum only on their ventral surfaces.
2. Identify the adrenal glands located cranial and medial to the kidneys. They are part of the endocrine system. Note that the medial surface of each kidney contains a concave opening, the hilus, through which blood vessels and the ureter enter or leave the kidney.
3. Identify the renal artery branching off the aorta and entering the hilus and the renal vein leaving the hilus and joining the inferior vena cava. Also identify the ureter caudal to the renal vein.
3. The urinary bladder is a pear-shaped musculomembranous sac located just cranial to the symphysis pubis. The urinary bladder is attached to the abdominal walls by peritoneal folds called ligaments.
4. The urethra is a duct which conducts urine from the neck of the bladder to the exterior.
5. Make sure that you look at cats of both sexes and are familiar with their structures!

MALE REPRODUCTIVE SYSTEM

1. Locate the following structures:
 - a. scrotum – contains the testes
 - b. testes – produce sperm; it will be necessary to cut open the scrotum to see these (if un-neutered)
 - c. epididymides – long, coiled tube that receives spermatozoa from a testis
 - d. vas deferens – continuation from the epididymis that carries spermatozoa to the urethra
 - e. prostate gland – at the junction of the vas deferens and the neck of the urinary bladder
 - f. penis – external organ of copulation ventral to the scrotum; covered by the prepuce

FEMALE REPRODUCTIVE SYSTEM

1. Locate the following structures:
 - a. ovaries – produce ova; pair of small, oval organs located slightly caudal to the kidneys
 - b. uterine tubes – lie on the cranial surfaces of the ovaries; receive ova and carry them to the uterus
 - c. uterus – Y-shaped structure located between the urinary bladder and the rectum
 - d. vagina – tube leading from the body of the uterus found caudal to the urinary bladder; leads to the urogenital sinus that is shared with the urethra

Analysis Questions:

1. What is the primary function of the kidneys?
2. Trace the pathway of urine from the kidneys to the outside of the body.
3. Trace the pathway of sperm from the testes to the outside of the body.
4. Trace the pathway of ova from the ovaries to the outside of the body.

If you have time:

1. Remove all of the muscles from the dorsal and lateral surfaces of the head. Using your scalpel, make an opening in the parietal bone, being careful not to damage the brain below. Slowly chip away all the bone from the dorsal and lateral surfaces of the skull until the brain is exposed. Between the cerebrum and cerebellum is a transverse bony partition called the tentorium cerebelli. It should be removed carefully.
2. Cut the spinal cord transversely at the foramen magnum. Gently lift the brain out of the floor of the cranium. As you do so, sever each cranial nerve as far from the brain as possible.
3. Using your lab manual, identify as many brain features as possible.