

Lesson Title: Comparative Anatomy, day 1

Objectives/ SWBAT:

Identify dissection tools. Properly use dissection tools. List major anatomical differences between mammalian and fish anatomy.

Lesson duration: 50 mins.(day 1 of 10)

Aim: How do the anatomies of a shark and fetal pig compare?

Do Now: List as many differences as you can think of between mammalian and fish physiology

Materials:

Dissecting kits, trays

paper towels

orange (or vegetable/fruit of choice)

Procedure:

1. Display each tool included in the dissecting kit, and discuss the appropriate instance to use that tool.
2. Based on the Do Now, create a chart on the board that summarizes the differences between mammals and sharks (see below).
3. Students practice the dissection techniques on a piece of fruit/vegetable.

Homework:

Read the handout with the dissection procedure for the following day.

Answer Key for step 2 of Procedure:

Mammals (fetal pig)

Sharks

skeleton	Bone + cartilage	Only cartilage (lighter weight)
thermoregulation	endotherms	ectotherms
respiration	lungs	gills (water in mouth, out gills, O ₂ extracted)
digestion	Long digestive tract	Short, spiral intestine
breeding	viviparous	Ovoviviparous (eggs hatch in oviduct of mom)
olfaction	poor	Keen (detect 1ppm blood in water)
buoyancy	N/A	Liver contains lots of squalene
jaw	Attached to skull	not attached to skull (extra strength)

Lesson Title: Comparative Anatomy, day 2

Objectives/ SWBAT:

Identify aspects of external fetal pig anatomy.

Lesson duration: 50 mins.

Aim: What can we observe about the external anatomy of the fetal pig?

Do Now: Prepare dissection supplies.

Materials:

Dissecting trays, scissors (to open pig bags)

Gloves, lab coats, paper towels

Preserved fetal pigs

Procedure:

1. Each student group should determine the gender of their assigned specimen.
2. Measure the body length from snout to tail in order to determine approximate age.
3. Examine uniquely mammalian characteristics such as hair.
4. Examine orifices: mouth, ears.
5. Examine nictitating membrane of eyes.
6. Additional parts: umbilical cord, feet, nipples.

Homework:

Read the handout with the dissection procedure for the following day.

Lesson Title: Comparative Anatomy, day 3

Objectives/ SWBAT:

Recognize the various body parts that comprise the digestive system. Understand how the organs function together to carry out a food consumption and digestion.

Lesson duration: 50 mins.

Aim: What can we learn about the mammalian digestive system?

Do Now: Prepare dissection tools.

Materials:

Dissecting kits, trays

Gloves, lab coats, paper towels

Preserved fetal pigs

Procedure:

1. Use scissors to cut back the sides of the mouth to examine the oral cavity. Examine the hard and soft palates. Note the teeth: some teeth may still be below gum line and will have to be dissected out. Examine taste buds.
2. Note opening of esophagus and glottis (& epiglottis).
3. Make a small snip with the scissors, above the umbilical cord, in order to establish an opening in which to insert the scissor. Make the first cut around the umbilical cord so that urinary/circulatory/reproductive parts stay intact for later examination. Then make a sagittal cut anteriorly through the abdominal and thoracic cavities. Separate the diaphragm from the body wall to open up the cavity.
4. Carefully move aside the internal organs to find the stomach. Trace the small intestine as it leads from the stomach to the caecum and large intestine, and then trace the large intestine to the anus.
5. Dissect open the stomach and note the rugae.

Homework:

Read the handout with the dissection procedure for the following day.

Lesson Title: Comparative Anatomy, day 4

Objectives/ SWBAT:

Know the chambers of the heart. Recognize the veins and arteries that comprise the circulatory system. Understand how they function together to carry out gas exchange. Trace the connections between the kidneys, ureters and bladder.

Lesson duration: 50 mins.

Aim: What can we learn about the mammalian circulatory and urinary system?

Do Now: Prepare dissection tools.

Materials:

Dissecting kits, trays

Gloves, lab coats, paper towels

Preserved fetal pigs

Procedure:

1. Discuss how the circulatory system enables gas exchange. Explain differences in the fetal versus adult circulatory systems. Explain latex labeling of the circulatory system.
2. A demo is carried out to show how to remove the pericardium, and how to identify the 4 chambers of the heart.
3. Locate the *ductus arteriosus* (and stress that this is only found in the fetal stage).
4. The heart is dissected from the body, and dissected so as to reveal the chambers internally.
5. Move aside the internal organs to locate the vena cava dorsally, and trace it anteriorly and posteriorly. Locate the aorta.
6. Locate the bladder on the flap of skin by the umbilical cord. Trace the route from the bladder, along the ureters to the kidneys.
7. Remove a kidney and section it sagittally to reveal the cortex and the medulla. Discuss the role of the kidney in the urinary system.

Homework:

Read the handout with the dissection procedure for the following day.

Lesson Title: Comparative Anatomy, day 5

Objectives/ SWBAT:

To name the organs that comprise the respiratory, reproductive, and central nervous systems. Understand how form relates to function in the lungs. Understand the relation between the skeletal system and the central nervous system.

Lesson duration: 50 mins.

Aim: What can we learn about the mammalian respiratory, reproductive and central nervous systems?

Do Now: Prepare dissection tools.

Materials:

Dissecting kits, trays

Gloves, lab coats, paper towels

Preserved fetal pigs

Procedure:

1. Trace the route of air through nostrils to bronchi to bronchioles to alveoli (keep in mind that in a fetal organism the lungs are not yet in use). Review the function of the lungs.
2. Dissect out a portion of lung and examine the texture as a result of the presence of the alveoli, and how this maximizes the occurrence of gas exchange. Examine the diaphragm, and review the role it plays in breathing.
3. At the base of the occipital area of the skull, use a scalpel to make a sagittal section that continues to between the eyes of the pig. Use the scalpel to remove the skin from the skull. Then use scissors to sagittally cut the skull to examine the brain. The brain's texture will be too soft for removal/examination of the brain, however the meninges can be noted, as well the convolutions of the cerebrum. Portions of spinal cord can also be viewed by removing the vertebral bone.
4. Students must find the reproductive organs that pertain to the gender of their organism. They should trace the connections between the internal and external manifests.

Homework:

Read the handout for the shark dissection procedure that will begin the following class.

Lesson Title: Comparative Anatomy (day 6)

Objectives: SWBATS...

Students will familiarize themselves with the external anatomy of a dogfish shark. The students will know the key features of the shark that will be referred to in later lessons during internal dissections

Lesson duration: 50 mins.

Aim: To examine the external anatomy of the dogfish shark

Do Now: Pick up materials for dissection

Materials:

- Dogfish shark specimens
- Dissection kit
- Eye goggles
- Smocks
- Gloves

Procedure:

1. Background of dogfish shark natural history
 - What do sharks eat?
 - How do they breathe?
 - How are sharks different than mammals?
2. Discuss external anatomy of dogfish shark and the function of the features
 - Dorsal fins
 - Pelvic fins
 - Pectoral fins
 - Amupllae of lorenzini
 - Spiracles
 - Cloaca
3. Walk around and ask students to identify structure and function of anatomy

Homework:

None

Lesson Title: Comparative Anatomy (day 7)

Objectives: SWBATS...

Students will be able to distinguish different muscle groups in the dogfish and why the muscle groups are important. Students will be able to compare and contrast the different muscle groups in sharks to mammals.

Lesson duration: 50 mins.

Aim: To understand the different muscles in a shark body

Do Now: Pick up materials for dissection

Materials:

- Dogfish shark specimens
- Dissection kit
- Eye goggles
- Smocks
- Gloves

Procedure:

1. Discuss background of muscle types in dogfish shark
2. First dissection will be the tail cross section
 - Students will be shown a demo shark and the process of dissection
 - The important aspects of the dissection will be noted
 - Students will perform their own dissection and identify the parts in their shark
3. Second dissection will be the tail musculature
 - Students will be shown a demo shark and the process of dissection
 - The important aspects of the dissection will be noted
 - Students will perform their own dissection and identify the parts in their shark
4. Students will clean up their work areas

Homework:

None

Lesson Title: Comparative Anatomy (day 8)

Objectives: SWBATs...

Students will be able to contrast respiration in sharks versus mammals. Students will also be able to identify important parts of the respiratory system in sharks. The students will understand which arteries and veins carry blood to and from the heart and gills. Students will also understand the differences associated with a dogfish heart and a mammal heart.

Lesson duration: 50 mins.

Aim: To examine the respiratory, digestive and circulatory systems in a shark

Do Now: Pick up materials for dissection

Materials:

- Dogfish shark specimens
- Dissection kit
- Eye goggles
- Smocks
- Gloves

Procedure:

1. Background of feeding, respiration, and circulatory system.
2. Students will dissect the mouth region of the dogfish shark.
 - Mouth region in dogfish includes digestion, respiration, and circulatory processes
 - Students will identify teeth, tongue, gill slits, and the pharynx
 - Students will identify arteries and what type of blood the arteries carry (oxygenated or not) and where the arteries carry the blood to
3. Students will dissect out the heart.
 - Students will identify key features of the heart.
 - Sinus venosus
 - Atrium
 - Ventricle
 - Conus arteriosus

Homework:

None

Lesson Title: Comparative Anatomy (day 9)

Objectives: SWBATs...

Students will be able to compare and contrast the internal anatomy of the dogfish with the internal anatomy of mammals. Students will understand the differences in shape and size of features such as the liver and stomach. Students will know what a spiral valve is and its function.

Lesson duration: 50 mins.

Aim: To examine the internal anatomy of the dogfish shark

Do Now: Pick up materials for dissection

Materials:

- Dogfish shark specimens
- Dissection kit
- Eye goggles
- Smocks
- Gloves

Procedure:

1. Background of the major body organs
2. Students will dissect the visceral cavity and identify the major organs found within
 - Liver
 - Gall bladder
 - Stomach
 - Spiral valve
 - Spleen
 - Kidneys
 - Testis
 - Ovaries
3. Students will dissect any part of the dogfish that hadn't been looked at in other lessons
 - Such as the brain, reproductive system, and the vision system
4. Students will clean up their dissection area

Homework:

None