Rat Dissection

2015-16
Rat Dissection Pre-Lab

The Norway rat, *Rattus norvegicus*, belongs to the family Muridae, a large group of rodents that includes the house mouse, gerbil, and hamster. The rat is believed to have originated in Asia and migrated to Europe in the mid-1550s. During the fourteenth century it is estimated that almost half of the population of continental Europe was killed as a result of the “Black Death,” or bubonic plague that is carried by rats. Rats are thought to have migrated to North America in the late 1700s after stowing away on ships. In addition to disease, the rat also wrecks havoc on farmer’s crops, attacking small animals, etc.

Rats can be beneficial as well. They have allowed for important scientific discoveries in the laboratory environment in the areas of AIDS, cancer, and brain research. They are a valuable research and diagnostic tool due to their anatomical and physiological similarities to the human, high reproductive rate, and ease of maintenance. Rats typically begin to breed at 3 months of age and can produce a litter of about 8 young every 21-25 days. The average lab rat’s lifespan is about 36 months, whereas rats in the wild typically live about 12-18 months.

Rats and humans belong to Kingdom Animalia, Phylum Chordata, Subphylum Vertebrata, and Class Mammalia. The two primary mammalian characteristics that distinguish them from other vertebrates such as fish, amphibians, birds, and reptiles, is that their skin is covered with hair or fur and they have milk producing mammary glands in the female to nurse the young. The rat is a vertebrate, which means that many aspects of its structural organization are common with all other vertebrates, including man. Some scientists interpret the similarity of structures among related organisms as evidence for common ancestry others interpret this as evidence for a common design and thus a common designer.

In a way, studying the rat is like studying a human. As the leading theme of this lab, ask yourself: for every structure observed in the rat, there is an equivalent structure in your own body - what is the structure and where is it located. As the second leading theme, pay particular attention to the relationships among organs and groups of organs. Structural parts are not "just there" in random locations. Their specific layout within the body contributes to making certain functions possible.

Therefore, for every structure seen, you should determine the following:

- What **organ system** it belongs to?
- How it is **connected** with other components?
- What is the organ or structures **general function**?
- What is the organ or structures **specific function** (if applicable)?
Below is the entire classification of the white laboratory rat (a variety of the Norway rat) and humans.

**White Rat**
- **Kingdom**: Animalia
- **Phylum**: Chordata
- **Subphylum**: Vertebrata
- **Class**: Mammalia
  - **Order**: Rodentia
  - **Family**: Muridae
  - **Genus**: Rattus
  - **Species**: norvegicus
  - **Variety**: albinus

**Human**
- **Kingdom**: Animalia
- **Phylum**: Chordata
- **Subphylum**: Vertebrata
- **Class**: Mammalia
  - **Order**: Primates
  - **Family**: Homidae
  - **Genus**: Homo
  - **Species**: sapien

As you can see, rats and humans are similar through Class Mammalia; it is at the Order level where they differ. It is thought that there are probably more species of rodents today than all other mammals combined.

**Dissection and Exploration Procedure**: Dissecting tools will be used to open the body cavity of the rat and observe the structures. Keep in mind that dissecting does not mean "to cut up"; in fact, it means, "to expose to view". Careful dissecting techniques will be needed to observe all the structures and their connections to other structures. You will not need to use a scalpel. Contrary to popular belief, a scalpel is not the best tool for dissection. Scissors serve better because the point of the scissors can be pointed upwards to prevent damaging organs underneath. Always raise structures to be cut with your forceps or probes before cutting, so that you can see exactly what is underneath and where the incision should be made. Never cut more than is absolutely necessary to expose a part.
Rat Dissection Pre-lab and Vocabulary

Pre-lab background information – use pre lab packet to answer following questions.

1. The Norway rat belongs to the family ______________. List the other members of this group of rodents.

2. What disease did rats carry that was responsible to killing almost half of the population of Europe during the fourteenth century?

3. How and when did rats get to North America?

4. Use 3 complete sentences to explain the benefits of rats for scientific research.

5. Fill in the following classification table

<table>
<thead>
<tr>
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<th>Rats</th>
<th>Humans</th>
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<tr>
<td>Kingdom</td>
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6. What characteristics distinguish rats and humans from other vertebrates?

7. Explain why studying a rat is like studying a human.

8. What does dissecting mean?

9. Why do we use scissors instead of a scalpel?

10. Explain the proper dissection procedure in complete sentences.

Lab Rat dissection Vocabulary – Use vocab packet AND your brain to answer the following questions:

Define the following:

1. Anterior –
2. Posterior –
3. Dorsal –
4. Ventral –
5. Lateral –
6. Medial –
7. Proximal –
8. Distal –
9. Digits –
10. Aperture – (HINT: look at the 3 different types of apertures in the vocab packet to figure out what it means)

(Use your brain and your notes to complete question 11 and 12)

11. Put the respiratory system in order from nose/mouth to alveoli

12. Put the digestive system in order from mouth to anus.

13. What are the differences between the thoracic and abdominal cavities?

14. What separates the two?

15. What is the main organ used to collect liquid waste from the bloodstream?

16. Label the following on the heart:
   a. Right atrium
   b. Right ventricle
   c. Left atrium
   d. Left ventricle
Lab Rat Dissection Vocabulary

Anatomical Terminology (Part 1):
Directions or Positions

- **Anterior** - toward the head
- **Posterior** - toward the tail
- **Dorsal** - toward the backbone
- **Ventral** - toward the belly
- **Lateral** - toward the side
- **Medial** - toward the midline
- **Proximal** - lying near the point of reference
- **Distal** - lying further from the point of reference

Planes or Sections through the Body

- **Transverse (cross section)** - perpendicular to the long axis of the body
- **Saggital** - a longitudinal section separating the body into right and left sides
- **Frontal** - a longitudinal section dividing the specimen into dorsal and ventral parts

External Features (Part 1):

- **Nostrils** - allows air into the trachea; found at the most anterior point of the rat’s body
- **Vibrissae** - whiskers (stiff hairs); extremely sensitive to touch and possibly to changes in air pressure
- **Pinnae** - external ears; sense sound
- **Forelimbs** - front legs used for grasping and holding
- **Hind limbs** - back legs used for running, climbing, jumping; more powerful than forelimbs
- **Digits** - finger-like projections on limbs (5 on each limb)
- **Digital Pads** - swollen thickenings of skin located at the tips and bases of the digits
- **Foot Pads** - six swollen thickenings of skin located in the sole of each foot
- **Urethral Aperture** - opening for release of urinary waste in females
- **Vaginal Aperture** - female genital opening; leads to vagina and uteri
- **Anus** - posterior opening located at the base of tail in males and females for excretion of solid waste
- **Urogenital Aperture** - opening of the penis; discharges urinary waste and sperm
Scrotum - a double pouch that contains the two testes
Mammary Papillae - 12 nipples of female used for nursing young
Tail - balancing organ; about ⅓ the length of the rat; covered in bristles and scales

**Mouth, Throat and Thoracic Cavity (Part 2):**

**Mouth-**
- **Esophagus** - muscular tube, dorsal to the trachea, used to pass food from the mouth to the stomach
- **Tongue** - elongated muscular structure visible upon the floor of the mouth
- **Hard Palate** - anterior portion of the palate located in the roof of the mouth; bony
- **Soft Palate** - posterior portion of the palate; muscular
- **Molars** - teeth for chewing
- **Incisors** - teeth for biting

**Respiratory System-**
- **Diaphragm** - muscular wall that moves to fill and empty the lungs of air
- **Trachea** - windpipe; prominent banded tube that leads from the neck to the lungs
- **Larynx** - voice box; located at the top of the trachea
- **Lungs** - consists of 4 lobes; organ used for exchange of gases from bloodstream

**Circulatory System-**
- **Heart** - major organ of the circulatory system; consists of left and right atria and ventricles
  - **Atria** - sac-like portions of heart that receives the blood
  - **Ventricles** - muscular portion of heart that pumps blood out

**Immune System-**
- **Thymus** - gland responsible for establishing immune system and T-cell development

**Abdominal Cavity (Part 3):**

**Digestive System-**
- **Caecum** - sac-like tube that forks off of the small intestine where the large intestine meets
- **Rectum** - tube that extends from the large intestine to the outside of the rat
- **Liver** - regulates blood glucose; makes bile
- **Bile** - digestive juice; helps break down fat molecules
- **Stomach** - mixes food with digestive juices
- **Small Intestine** - where most of nutrient absorption takes place
- **Large Intestine** - removes water from undigested food, prepares feces for defecation
- **Mesentery** - thin membranous tissue that holds organs in place
- **Pancreas** - secretes the hormone insulin into the bloodstream; releases digestive enzymes into small intestine

**Circulatory System-**
- **Spleen** - reservoir for blood; filter blood; manufactures white blood cells

**Cavities-**
- **Abdominal Cavity** - area posterior to the diaphragm, contains internal organs
- **Thoracic Cavity** - area anterior to the diaphragm, contains heart and lungs
Urinary and Reproductive System (Part 4):
- **Kidneys** - major excretory organ, removes wastes from blood
- **Ureters** - transport urine from the kidneys to the urinary bladder
- **Urinary Bladder** - temporary storage of urine
- **Ovaries** - female gonads that produce female gametes, and female sex hormones
- **Uterine Horns (Uteri)** - site of rat embryo development; allows for multiple births
- **Testes** - male gonads the produce sperm and male sex hormones
- **Prostate Gland** - secretions responsible for the activation of sperm
- **Penis** - discharges urine and sperm
Rat Identification

*These are all the parts/organs that you must be able to identify on your rat.

**External Features (Part 1)**
1. Anterior
2. Posterior
3. Dorsal
4. Ventral
5. Nostril
6. Vibrissae
7. Pinnae
8. Forelimb
9. Hind Limb
10. Digit
11. Digital pad
12. Foot Pad
13. ♀ Urethral Aperture
14. ♀ Vaginal Opening
15. ♂ Urogenital Aperture
16. ♂ Scrotum
17. Anus
18. Mammary papillae
19. Tail

**Mouth, Throat and Thoracic Cavity (Part 2):**

Mouth
1. Incisors
2. Molars
3. Hard palate
4. Soft palate
5. Tongue

Throat and Thoracic Cavity
6. Trachea
7. Larynx
8. Esophagus
9. Thymus
10. Heart
   Atria
   Ventricles
11. Lungs
12. Diaphragm
Abdominal Cavity (Part 3)
1. Thoracic cavity
2. Abdominal cavity
3. Liver
4. Stomach
5. Spleen
6. Pancreas
7. Small Intestine
8. Large Intestine
9. Rectum
10. Caecum
11. Fat bodies
12. Mesentery

Urinary and Reproductive System (Part 4)
1. Kidney
2. Ureters

Male
1. Testes
2. Epididymis
3. Vas Deferens
4. Seminal Vesicles
5. Prostate Gland
6. Urinary Bladder
7. Penis

Female
1. Uterine Horn (Uteri)
2. Ovary
3. Uterus
4. Urinary Bladder
5. Vagina
RAT
External Dissection Questions

Part 1:
Label the picture using the terms: anterior, posterior, dorsal, ventral.

Part 2:
Write the correct vocabulary term for each of the following definitions.

1. Limbs used for running, climbing, and jumping. _______________________________________
2. Limbs used for grasping and holding. _______________________________________________
3. Number of digits on each limb. ____________________________________________________
4. Organ covered with bristles and scales used for balance. _______________________________
5. Female genital opening. __________________________________________________________
6. Female opening for urinary waste. _________________________________________________
7. Opening of penis for discharge of urinary waste and sperm. ____________________________
8. Nipples of female used for nursing young. ___________________________________________
9. Male pouch that contains the testes. _______________________________________________
**Part 3:**
Answer the following questions about the external anatomy.

1. What are the four readily identifiable areas of the rat body?
   a. ______________________
   b. ______________________
   c. ______________________
   d. ______________________

2. a) What color do the rat’s eyes appear? _____________________________________________
   b) Why do they appear this way? __________________________________________________

3. a) Which is firmer to the touch the thorax or the abdomen? __________________________
   b) Why? ______________________________________________________________________

4. a) How many limbs does a rat have? _______________________________________________
   b) How many digits are on each limb? ______________________________________________

5. What are the three separate apertures (openings) located on the posterior ventral abdominal surface of a female rat?
   a. ______________________
   b. ______________________
   c. ______________________

6. What are the three identifying external features of a male rat (again located on the posterior ventral abdominal surface)?
   a. ______________________
   b. ______________________
   c. ______________________

7. a) How many mammary papillae do female rats have? ________________________________
   b) Do male rats have these? _____________________________________________________

8. How long is the tail of the rat as compared to the body? ______________________________

9. What two features cover the tail’s surface?
   a. ______________________
   b. ______________________
**You will not be doing any cutting today. Examine the specimen you have received.**

The body is divided into four readily identifiable areas:
- head  
- neck  
- trunk  
- tail

**Head**
- Nostrils—these are found at the most anterior point of the rat’s body.
- Eyes—the eyes are protected by an upper and lower eyelid. In the inner (anterior) corner of the eye, locate a third lid-like transparent structure, the *nictitating membrane*, which in live rats may be drawn across the eyeball. In the white rat, the eyes are not pigmented and appear pink.
- Vibrissae—these are the long whiskers, or stiff hairs, extending from the anterior portions of the rat’s head.
- Pinnae—these are the external ears.

**Trunk**—the trunk is divided into two sectors, the more anterior thorax, and the more posteriorly located abdomen. Internally, a muscular diaphragm separates the two. Press the ventral surface of the trunk and note that the thorax is firmer than the abdomen. This is due to the presence of ribs around the thorax.

**Appendages**—two pairs of appendages originate from the trunk: two forelimbs and two hind limbs. The forelimbs are for grasping and holding. The much more powerful hind limbs are used mainly in running, climbing, and jumping, as well as for support. Each of the four limbs has five digits.
- Digital pads and Foot pads—these are swollen thickenings located on the surface of the forefoot and hind foot. The digital pads are located at the tips and bases of the digits, and the foot pads are located on the sole of each foot.

**Male or Female**

Female:
- Urethral Aperture—this is the most anterior of the three.
- Vaginal Aperture—this is the female rat’s genital opening, leading to the vagina and uteri.
- Anus—most posterior of the three apertures. It is located at the base of the tail.

Male:
- Urogenital Aperture—opening of the penis.
- Scrotum—double pouch that contains the testes, located posterior and lateral to the urogenital opening.
- Anus—most posterior aperture.

**Mammary Papillae:**
- Nipples or teats—external papillae of the mammary gland are more readily visible in pregnant or lactating females. The teats are usually twelve in number.

**Tail**
The tail of the albino Norwegian rat is about three-quarters the length of head and trunk combined. The tail is essentially a balancing organ giving stability in climbing and crossing over open areas such as water. The surface of the tail is covered by rows of overlapping reptile-like scales. Three short bristles project from under the edge of each scale.
Mouth, Throat and Thoracic Cavity

Part 2

**Mouth**

**Dissection:** Cut the bones at the angles of the jaw.

1. Identify the two different types of teeth-
   - **Incisors** - are the two top and bottom teeth that stick out; they grow throughout the life of the rat and are constantly worn down and honed into sharp chisels by gnawing on hard substances; used for biting
   - **Molars** - are used for chewing and are located on both sides of the incisors

2. Next we will look at the palate-
   - **Hard Palate** - anterior portion of the palate supported by bone, contains a series of transverse ridges that cross the roof of the mouth
   - **Soft Palate** - this is the posterior continuation of the palate and is muscular rather than bony.

   **Dissection:** Continue to cut posteriorly with your scissors and press down on the jaw to expose the openings of the *trachea* and the *esophagus*.

3. The esophagus is the opening located dorsally behind the muscular tongue.

4. You might also be able to see the opening to the trachea which is called the *glottis*. The glottis is guarded by a cone-shaped flap of cartilage, the *epiglottis*. The epiglottis prevents food from entering the trachea.
Dissection: Locate the posterior portion of the rib cage of your rat. Cut through the thoracic cavity of the rat following the incision 1 located in Figure 1. Do not cut too low or you will risk cutting the diaphragm. Then make incision 2 from where you started cutting the first time to each side of the rat. Be careful not to cut too deeply and keep the tip of your scissors pointed upwards. You do not want to damage the underlying structures.

1. Locate the **diaphragm** which is a thin layer of muscle that separates the thoracic cavity from the abdominal cavity and moves to fill and empty lungs of air.

2. Locate the **trachea** which is found along the mid-ventral portion of the neck in the thoracic cavity. This tube is commonly called the **windpipe**. The trachea is kept open by rings of cartilage which extend around it at intervals. Located at the top of the trachea is the **larynx** also known as the **voice box**.

3. The **esophagus** is located dorsal to the trachea. To find it you will have to run your dissection probe gently behind the trachea.

4. The **heart** is centrally located in the thoracic cavity. The two dark colored chambers at the top (anterior portion) are the **atria** (single: atrium), and the larger bottom (posterior) chambers are the **ventricles**.

5. Locate the **thymus gland** which lies directly over the anterior portion of the heart. The thymus functions in the development of the immune system.

6. The **lungs** are found on either side of the heart.
Abdominal Cavity (Digestive System)

Part 3

Dissection: Cut incision 3 slightly posterior to the diaphragm and stop just anterior to the urogenital openings. Then make incision 4 cutting slightly above the hind limbs. You may have to break the hindlimbs if they are in your way.

Figure 1 continued
1. Locate the **liver** which is a dark colored organ suspended just under the diaphragm. The liver has many functions, one of which is to produce bile which aids in digesting fat. The liver also stores glycogen and transforms wastes into less harmful substances. There are four parts to the liver:
   - **Median or cystic lobe**—located atop the organ, identified by a central cleft
   - **Left lateral lobe**—large and partially covered by the stomach
   - **Right lateral lobe**—partially divided into an anterior and posterior lobule, hidden from view by the median lobe
   - **Caudate lobe**—small, folds around the esophagus and the stomach, seen most easily when liver is raised

2. Locate the **bile duct** a small tube that connects the various lobes of the liver and carries bile to the small intestine.

3. We will now follow the path of how food moves through the digestive tract.

4. The **esophagus** pierces the diaphragm and moves food from the mouth to the stomach. Food is pushed forward in the esophagus by the rhythmic contractions of its walls, a process known as **peristalsis**. It is distinguished from the trachea by its lack of cartilage rings.

5. Locate the **stomach** on the left side just under the diaphragm and below the liver. The functions of the stomach include food storage, physical breakdown of food, and the digestion of protein. The opening between the esophagus and the stomach is called the **cardiac sphincter**. The attachment between the stomach and the intestine is called the **pyloric sphincter**.

6. The **small intestine** is a slender coiled tube that receives partially digested food from the stomach (via the pyloric sphincter). It consists of three sections: **duodenum**, **ileum**, and **jejunum**. The coils of the small intestine are held in place by a fine membrane, the **mesentery**.

7. Locate the **large intestine** which is the large tube that extends from the small intestine and leads to the anus. The name of the large intestine is derived from its larger diameter. The large intestine is where the final stages of digestion and water absorption occur and it contains a variety of bacteria to aid in digestion.

8. Locate the **caecum**—a large sac in the lower third of the abdominal cavity. It is a dead-end pouch and is similar to the appendix in humans. It is also the point at which the small intestine becomes the large intestine. Its function is to digest cellulose of wood.

9. Locate the **rectum**—the short, terminal section of the large intestine between the intestine and the anus. The rectum temporarily stores feces of the digestive cavity.

10. Next are some other organs present in the abdominal cavity that aid in digestion and other body systems.

11. The **pancreas** is a brownish, flattened gland found in the tissue between the stomach and small intestine. The pancreas produces digestive enzymes and also secretes insulin. Find the pancreas by looking for a thin, almost membrane looking structure that has the consistency of cottage cheese.
12. The **spleen** is about the same color as the liver and is located on the left side of the stomach. It looks similar to a small tongue or balloon. The spleen is associated with the circulatory system and functions in the destruction of blood cells, manufacturing white blood cells, and blood storage.
Excretory and Reproductive System

Part 4

1. After you have removed the organs of the digestive system you should be able to locate the organs of the excretory system and the reproductive systems.

**Excretory System**

2. The primary organs of the excretory system are the **kidneys**. These organs are large bean shaped structures located toward the back of the abdominal cavity on either side of the spine.

3. Locate the delicate **ureters** that attach to the kidney and lead to the bladder. Wiggle the kidneys to help locate these tiny tubes.

4. The **bladder** is usually contracted into a small pear-shaped organ. Its function in both sexes is to temporarily store urine that has come down from the kidneys by way of the ureters. The **urethra** carries urine from the bladder to the exterior.

**Reproductive Organs of the Male Rat:**

**Dissection:** Cut through the scrotal sac carefully to reveal the testis.

1. The major reproductive organs of the male rat are the **testes** (singular: testis) which are located in the **scrotal sac**. On the surface of the testis is a coiled tube called the **epididymus** which collects and stores sperm cells. The tubular **vas deferens** moves sperm from the epididymus to the **urethra**, which carries sperm through the penis and out the body.

2. The lumpy brown glands (look like leaves) located to the left and right of the urinary bladder are the **seminal vesicles**. The gland below the bladder is the **prostate gland** and it is partially wrapped around the penis. The seminal vesicles and the prostate gland secrete materials that form the seminal fluid (semen).

**Dissection:** Carefully make an incision in the **urogenital aperture** of the male to locate the penis.

**Reproductive Organs of the Female Rat:**

1. The short gray tube lying dorsal to the urinary bladder is the **vagina**. The vagina leads to the **uterus** and then divides into two **uterine horns** that extend toward the kidneys. This duplex uterus is common in some animals and will accommodate multiple embryos (a litter). In contrast, a simple uterus, like the kind found in humans has a single chamber for the development of a single embryo.

2. At the tips of the uterine horns are small lumpy glands called **ovaries** which are connected to the uterine horns via **oviducts**. Oviducts are extremely tiny and are the curly structures on the ovaries. If you have a hand lens, you might be able to see blister-like bulges upon the ovaries. These bulges may be developing **follicles** that contain **egg cells**.
Reproductive Organs

Kidney
Seminal Vesicles
Bladder
Prostate Gland

Pictures of Abdominal Cavity

Liver
Spleen
Mesentery
Seminal Vesicles
Bladder
Kidney
Seminal Vesicles
Bladder
Prostate Gland
Stomach
Pancreas
RAT
Mouth, Throat, Thoracic Dissection Questions

Part 1:
Write the correct vocabulary term for each of the following definitions.

1. The teeth used for biting are called: ________________________________________________

2. The teeth used for chewing are called:  ______________________________________________

3. Voice box. _____________________________________________________________________

4. A muscular wall that moves to fill and empty the lungs of air. __________________________

Part 2:
Answer the following questions about the mouth, throat, and chest cavity.

1. Which tooth type, incisor or molar, grows throughout the life of the rat? _________________

2. What part of the palate is bony and contains transverse ridges?  _________________________

3. What is the glottis? __________________________________________________________________

4. What is the function of the epiglottis? _________________________________

5. What is the common term for the trachea? ___________________________________________

6. Describe the physical differences between the esophagus and the trachea. _____________

7. How many lobes are in the lungs? __________________________________________________

8. Where are the atria of the heart? ___________________________________________________

9. Where are the ventricles of the heart? ______________________________________________

10. Which are larger atria or ventricles? ______________________________________________

11. What is the function of the Thymus - ______________________________________________

12. What 2 body cavities does the diaphragm separate? _________________________________

13. How are the Respiratory and Circulatory systems connected? ________________________
14. Draw a picture describing how the diaphragm allows the lungs to inflate and deflate.
RAT
Abdominal Cavity Dissection

Part 1:
Write the correct term for each of the following definitions.

1. Organ that regulates blood glucose, cholesterol, hormones, and makes bile. ____________________________

2. Fine, membranous tissue that holds organs in place. ____________________________________________

3. Organ that secretes insulin and other digestive enzymes. ________________________________

4. Large muscular pouch that mixes food and digestive juices. ______________________________

5. Reservoir for blood and manufacturing site for white blood cells. __________________________

Part 2:
Number the organs of the digestive system, as food would pass through it.

_____ Small Intestine
_____ Esophagus
_____ Large Intestine
_____ Anus
_____ Stomach
_____ Mouth

Part 3:
Answer the following questions about the abdominal cavity.

1. How is food moved through the esophagus? Name and explain the process. ____________________________

2. Identify the location of the stomach in reference to the liver and the esophagus. ________________

3. What is the name of the muscular valve at the opening of the stomach? __________________________

4. What is the name of the muscular valve at the end of the stomach? _____________________________
5. What are the three segments of the small intestine? Name them in order.
   a. ______________________
   b. ______________________
   c. ______________________

6. Why is the large intestine referred to as “large”? ________________________________

7. What is the function of the caecum? ____________________________________________

8. What structure in humans is thought to be derived from the caecum? _______________

9. Describe the location of the main portion of the pancreas (what is it near)? __________
   __________________________________________________________

10. Where is the spleen located? _________________________________________________

11. What system is the spleen associated with? ________________________________

12. What cavities does the diaphragm separate?
   a. ______________________
   b. ______________________
RAT
Excretory and Reproductive Systems

Part 1:
Write the correct term for each of the following definitions.

1. Organ for the temporary storage of urine before it is excreted from the body. ______________

2. Male gonads that produce sperm and male sex hormones. ______________________________

3. Site of rat embryo development. ___________________________________________________

4. Organ with secretions that activate sperm. ___________________________________________

Part 2:
Number the path of urine from the kidney until it is excreted from the body.

Ureters ____  Urethra ____  Kidneys ____  Urinary Bladder ____  Urogenital or Urinary Aperture ____

Part 3:
Answer the following questions about the urinary and reproductive system.

1. What is the function of the excretory system? ________________________________________

2. What is the function of the reproductive system? ___________________

3. Describe the appearance of the kidneys? ____________________________________________

4. Where are the kidneys located in the body cavity?  ____________________________________

5. What is the difference between the ureters and the urethra? _________________________

6. Where are the ovaries located in reference to the kidneys? ____________________________

7. What are the blister-like bulges that may be on the ovaries? __________________________

8. What is the major difference in the rat uterus as compared with the human uterus? _______

______________________________________________________________________________
9. a. What organs are the male gonads? 

b. Where are these organs located?
Rat Lab Practical and Test Review

Lab Practical

Know the following structures in/on the rat.

External:
Urethral aperture
Vaginal aperture
Pinnae

Thoracic:
Esophagus
Lungs
Thymus
Atrium
Trachea
Ventricle

Abdominal:
Large intestine
Liver
Stomach
Spleen
Small Intestine

Reproductive and Excretory:
Seminal vesicles
Testes
Urinary bladder
Ovary
Kidney
Uterine horns

Use the following websites to identify the structures of the rat.
http://kisdwebs.katyisd.org/campuses/KHS/teacherweb/dugasa/Lists/Calendar/calendar.aspx
http://www.utm.edu/staff/rirwin/public_html/RatAnat.htm
http://courses.missouristate.edu/TinaTamme/122/Rat%20Dissection/RatDissection.htm
(Go to the PowerPoint)
Rat

What is the purpose of the tail?

What is the anatomical name for the ears and what is the purpose of them?

Describe the incisors. Do they continue to grow the lifetime of the rat or do they grow to just one size?

Describe the molars. Do they continue to grow the lifetime of the rat or do they grow to just one size?

What is another name for the windpipe?

The diaphragm has two purposes. What are they?

What holds all the small intestines in place?

How many mammary papillae do rats tend to have?

Describe the function of the forelimbs.

Describe the function of the hind limbs.

What is the purpose of the urethral aperture?

What is the purpose of the urogenital aperture?

What two organs do rats have that humans do not have?

What is the function of the thymus?

What is the function of the caecum?

What is the function of the pancreas?

What is the function of the spleen?

Where are the testes located?
Describe the difference between the trachea and the esophagus.

Know the anatomical positions: anterior, posterior, dorsal, ventral.

Where is the anterior portion of the rat?
Where is the posterior portion of the rat?
What is the dorsal side?
What is the ventral side?