

GRASSHOPPER DISSECTION

Introduction:

Insects are arthropods with jointed appendages, segmented bodies, and an exoskeleton composed of chitin. Insects are in the class Insecta, & are the largest and most diverse group of animals on earth. The genus *Romalea* is a large grasshopper common in the southeastern United States. Insects have three body regions (head, thorax, & abdomen), 3 pairs of legs attached to the thorax, a single pair of antenna attached to the head, mouthparts adapted for chewing or sucking, and two pairs of wings. Some insects may have a single pair of wings or be wingless. Insect legs are often adapted for digging, crawling, jumping, or swimming. The insects are mostly terrestrial; they breathe air which enters small lateral openings on the body called spiracles and circulates in a system of ducts to all organs and tissues. Their chewing or sucking mouth parts are adapted for feeding on plant or animal materials.

Classification:

Kingdom - Animalia
Phylum - Arthropoda
Class - Insecta
Order - Orthoptera

Materials:

Lab apron, gloves, eyeglasses, dissecting pan, dissecting kit with forceps & scalpel, t-pins, magnifying glass, preserved grasshopper, paper, pencil.

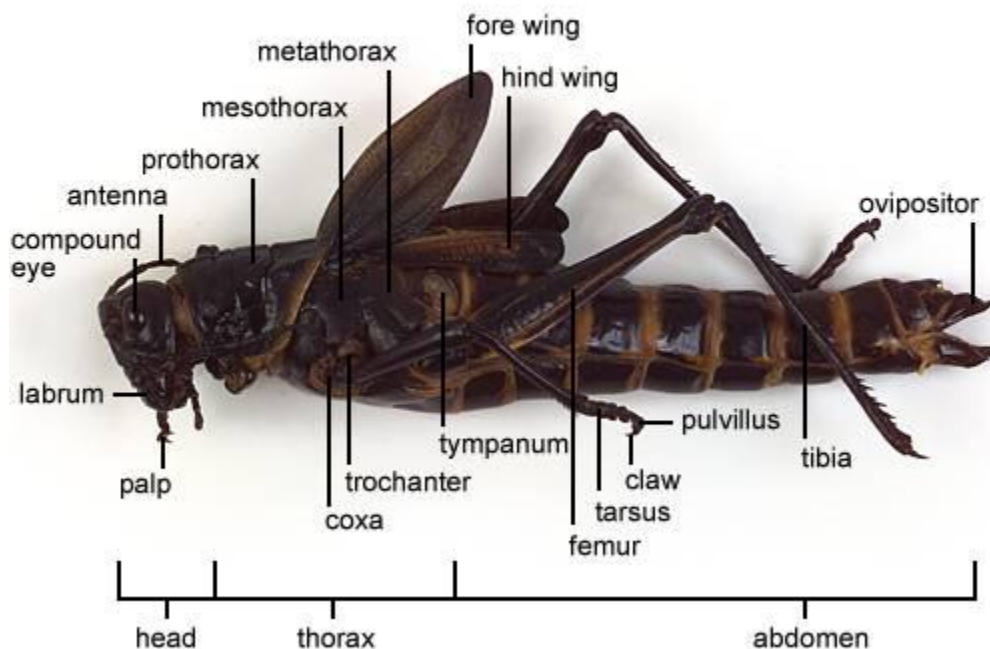
Objective:

Identify & label the internal & external anatomy of a grasshopper.

Procedure (Part 1: External Anatomy): Examine the entire grasshopper and identify the major subdivisions and parts of the body.

1. Obtain a preserved grasshopper & rinse off any preservative with water. Place grasshopper in the dissecting pan.

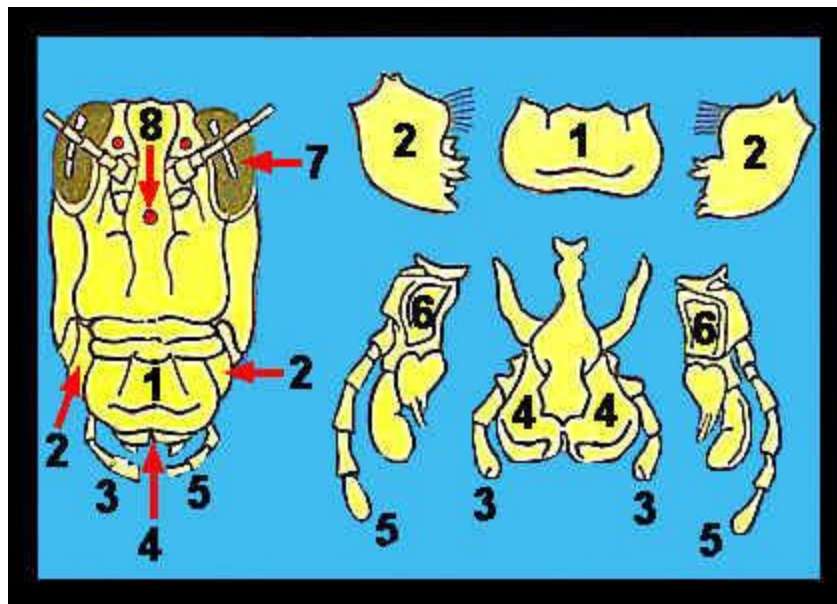
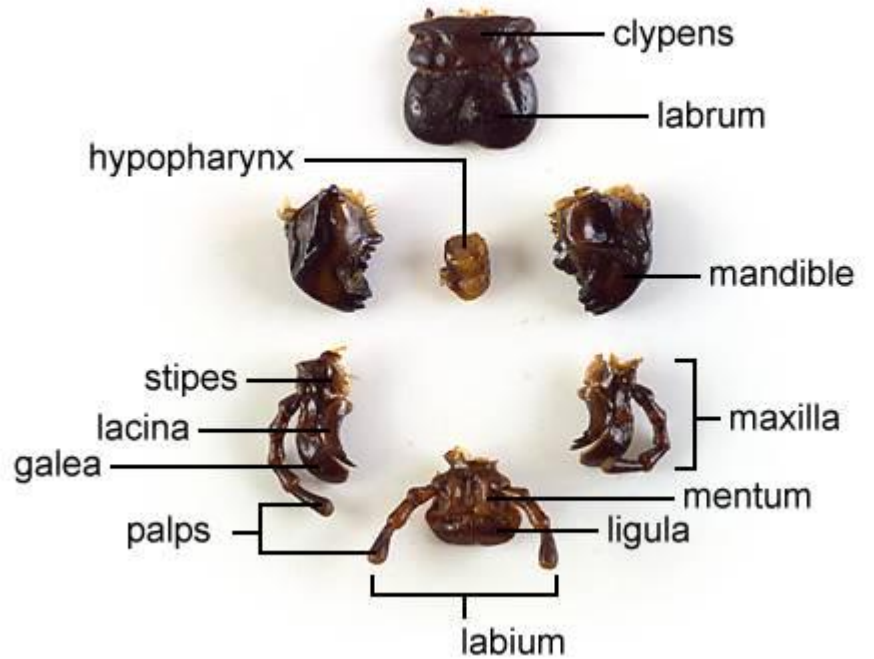
Grasshopper - External Features



2. Observe that the body of the grasshopper is divided into 3 regions --- the head, the thorax, and abdomen. Label these on Figure 2.
3. Examine the **head** and locate the following parts:
 - Antennae (two, slender appendages)
 - Compound eyes (2, large lateral)
 - Ocelli (or simple eyes) - 3, small, between compound eyes
 - Mouth parts - Labrum (upper lip), mandibles (jaws) below the labrum, maxillae located behind the mandibles to help cut & hold food, and the lower lip or labium



Grasshopper - Mouthparts



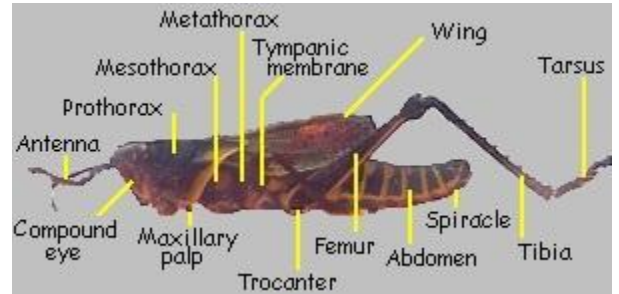
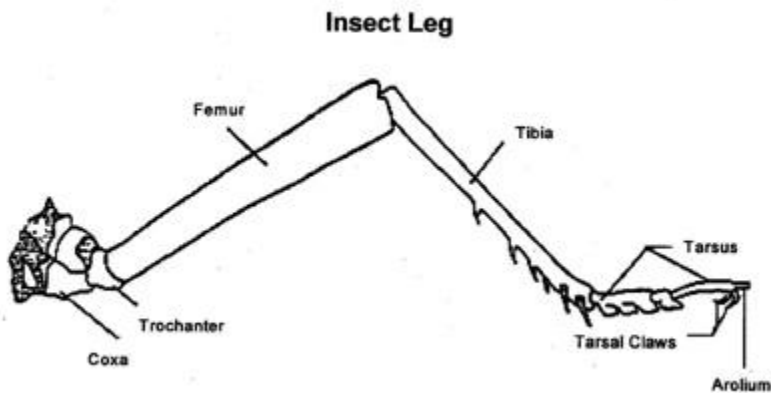
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|-----------------|--------------------|
| 1. Labrum | 4. Labium |
| 2. Mandibles | 5. Maxillary Palps |
| 3. Labial Palps | 6. Maxillae |
| 7. compound eye | 8. ocelli |

- Label the mouthparts, eyes, and antenna on Figure 1.
- Examine the following appendages on the thorax (middle section of the grasshopper's body):

THORAX

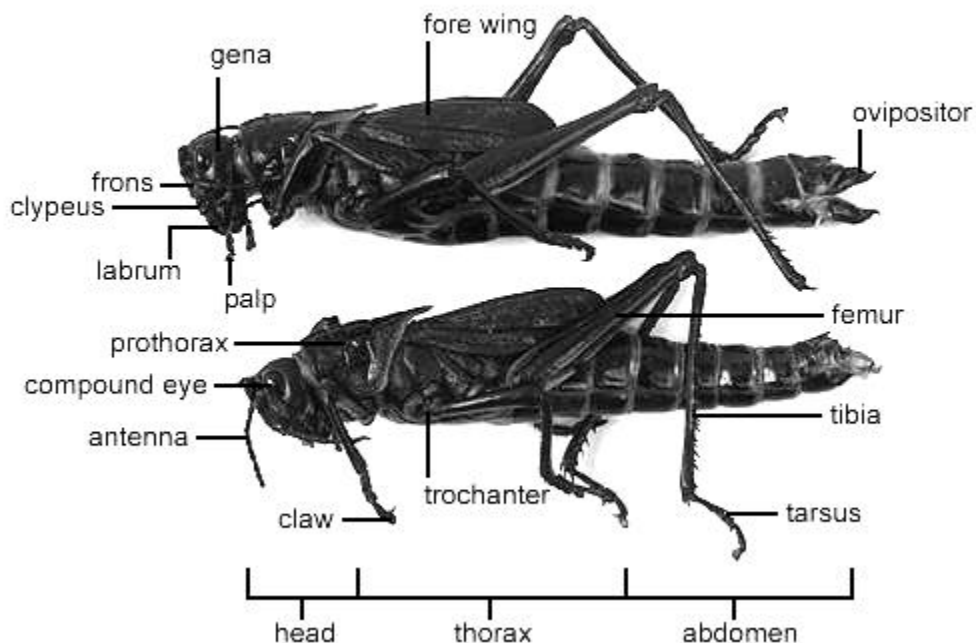
Legs (first 2 pairs are for walking & the last pair are for jumping)

Wings (forewings have a leathery appearance & protect the hind wings)



- Using forceps, remove one of the walking legs and identify these parts --- the coxa connects the femur (the thickest part of the leg) to the grasshopper's body; a slender, spiny tibia connects the femur to the tarsal segments (lowest part of the leg). Label these on Figure 2.
- Raise both pairs of wings and locate the first abdominal segment.
- Locate the tympanic membrane or eardrum on the first abdominal segment. Label this on Figure 2.
- Using a magnifying glass, locate the spiracles or tiny pores for respiration on each side of the abdominal segments. Label these on Figure 2.
- Determine if your grasshopper is a male or female by looking at the end of the abdomen. Females have a tapered abdomen that ends in a pointed egg laying tube called the ovipositor. Male have a more rounded abdomen that turns upward.
- Label the ovipositor on Figure 2.

Grasshopper - External Features (Female and Male)



ABDOMEN

- Spiracles (small openings on the side of somites or body segments)
- Auditory Organs (two located laterally on the 1st body somite or segment)
- Ovipositor (on female)

Observations & Conclusion:

Figure 1 - Grasshopper Head (Label ALL parts.)

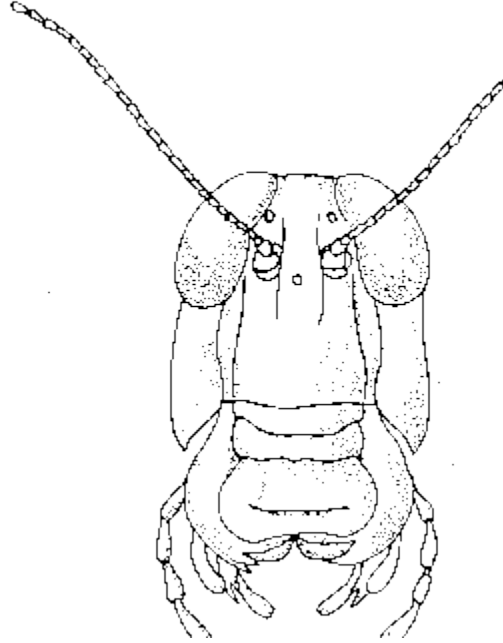
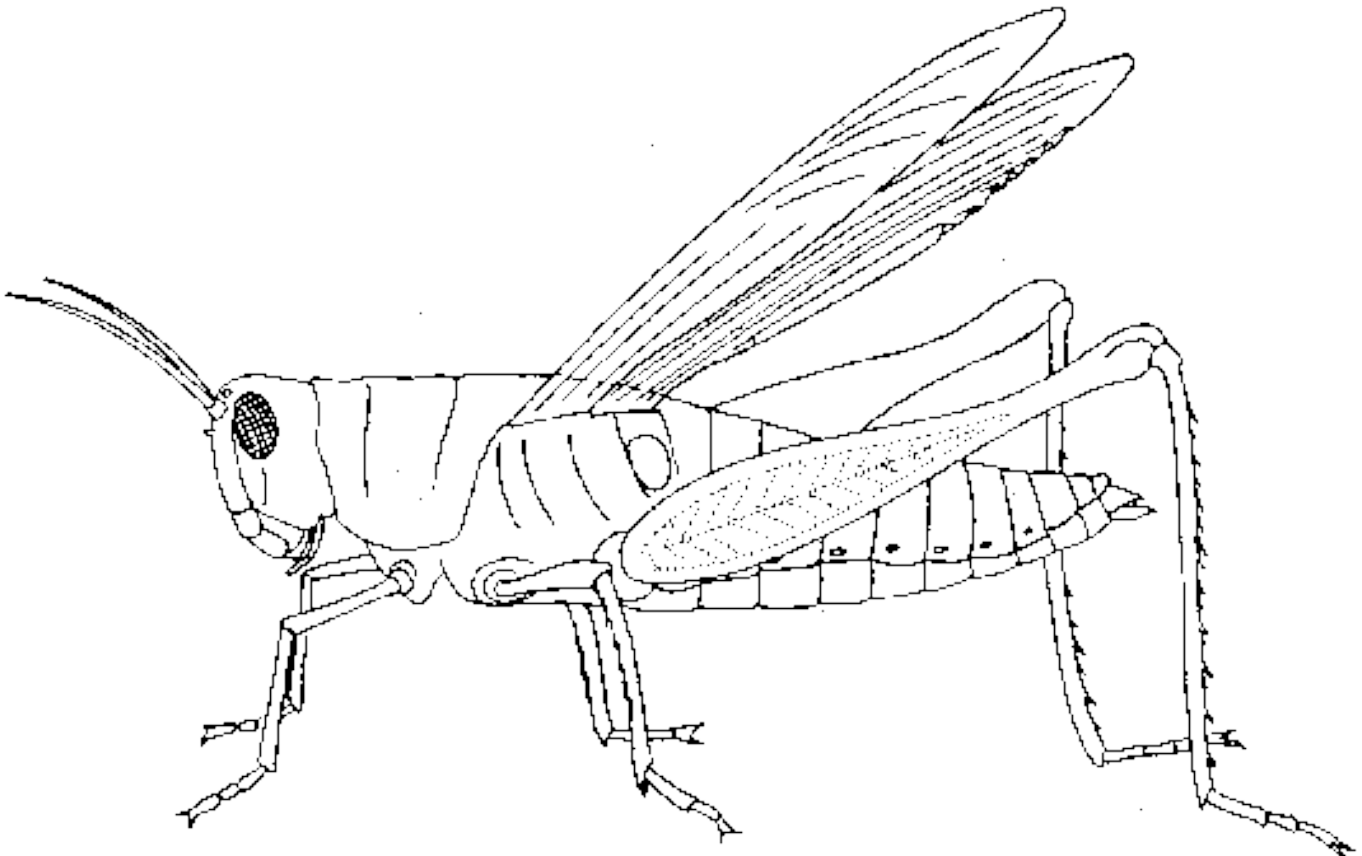
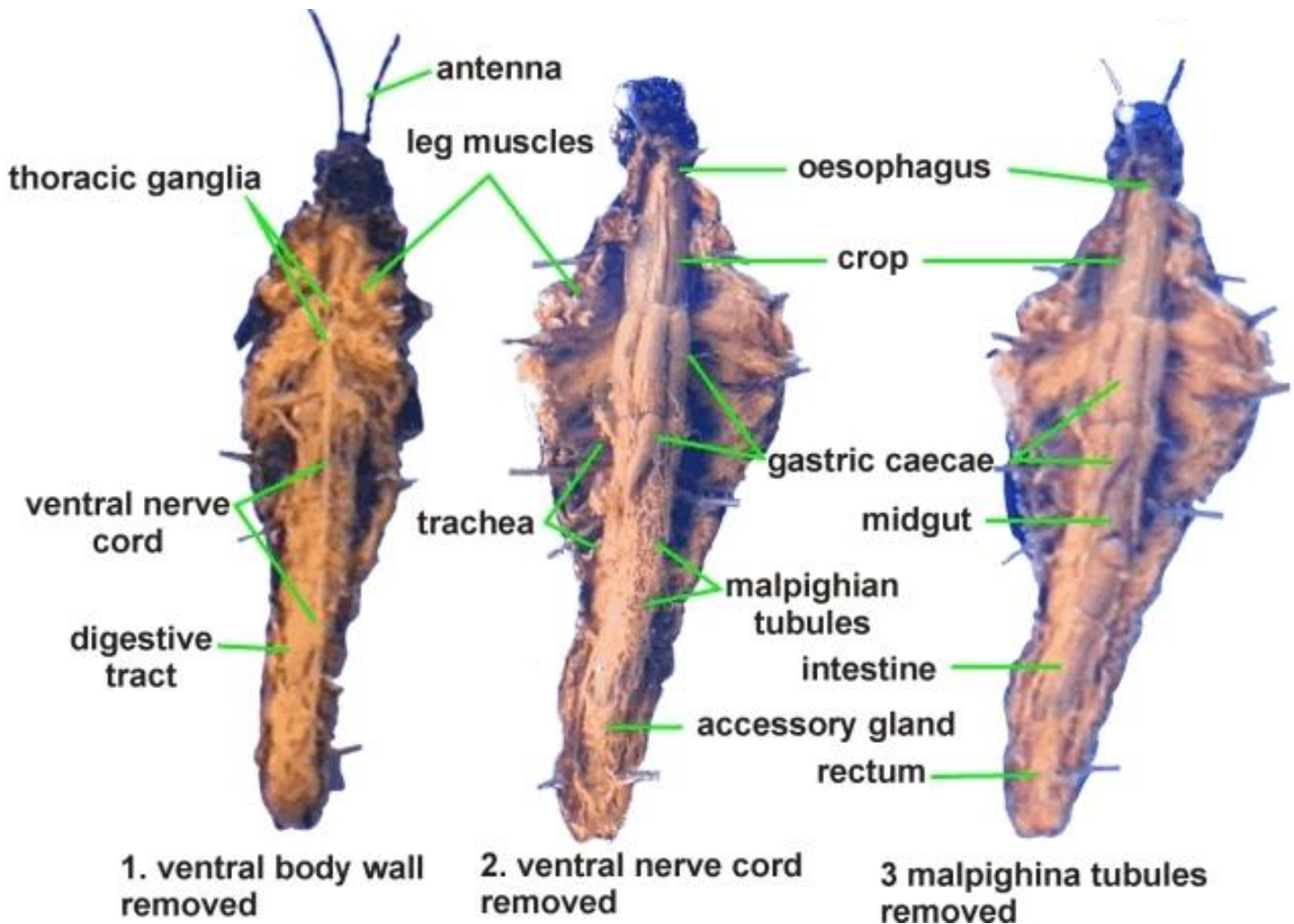


Figure 2 - External Grasshopper anatomy (Label ALL parts.)



1. Which region of the insect's body is specialized for sensory functions? Explain your answer.
2. Which region of the insect's body is specialized for movement & explain why?
3. What is the purpose of compound eyes? of simple eyes?
5. How are the ends of the legs adapted for holding onto plants?
6. How is the third pair of legs adapted for jumping?
7. Describe the differences between the two pairs of wings (appearance & function).
8. How does the tympanic membrane help a grasshopper?
9. What system do spiracles open into on a grasshopper?
10. Do all abdominal segments have spiracles? Are there any spiracles on the thoracic segments?
11. How did you determine the gender of your grasshopper?

Part 2—Internal Structure



1. Remove the three left legs. Insert the point of your scissors under the top surface of the last segment of the abdomen. Make a cut to the left of the mid-dorsal line. Be careful not to cut the organs underneath. In front of the thorax, cut down the left side to the bottom of the grasshopper. Cut down between the next to the last and last abdominal segments.

***** CAUTION: Always be careful with all sharp objects. *****

2. Use your forceps to pull down the left side. Locate the large dorsal blood vessel.

3. Use your scissors to cut the muscles close to the exoskeleton. Locate the finely branched trachea leading to the spiracles.

4. Cut through the exoskeleton over the top of the head between the left antenna and left eye to the mouth. Remove the exoskeleton on the left side of the head. Find the dorsal ganglion or brain.

5. Cut away the tissue to show the digestive system. Refer to Figure 3 and identify the mouth, esophagus, crop, gizzard, and stomach. Note that the gizzard and stomach are separated by a narrow place. The digestive glands, called gastric caeca, that secrete enzymes into the stomach are attached here.

6. Another narrow place separates the stomach from the intestine. Malpighian tubes, which collect wastes from the blood, are located here.

7. Observe the colon, which enlarges to form the rectum. Wastes collect here before passing out the anus.

8. In the female, the ovary is located above the intestines. In the male, a series of whitish tubes, the testes, are located above the intestine.

9. *Throw away all dissected materials for disposal. Always wash your hands after a dissection procedure.*

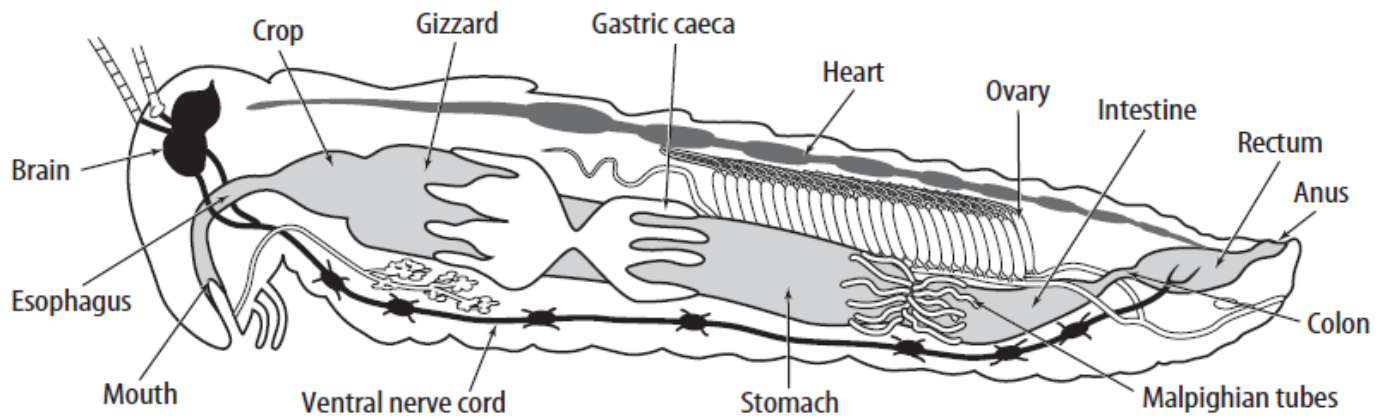


Table 1 Internal Structure of the Grasshopper

Body Part	Function: What does it do?
Air Tubes	
Ovaries	
Esophagus	
Crop	
Gizzard	
Stomach	
Intestine	
Rectum	
Anus	

Name the three parts of a grasshopper's body.

1. _____ 2. _____ 3. _____

4. Can you drown a grasshopper by holding its head underwater? Why or why not?

5. The grasshopper belongs to the Phylum _____

6. The grasshopper belongs to the Class _____

7. Which of the 5 Kingdoms does the grasshopper belong to? _____

8. Name one reason a grasshopper population may increase rapidly. _____

Clean up & Hand in (Check blank after completing)

- _____ Place grasshopper in trash can.
- _____ Rinse out dissection tray and all dissection tools three times with water at the sinks.
- _____ Place dissection trays on the back room counter
- _____ Return dissection utensils to the correct plastic container.