

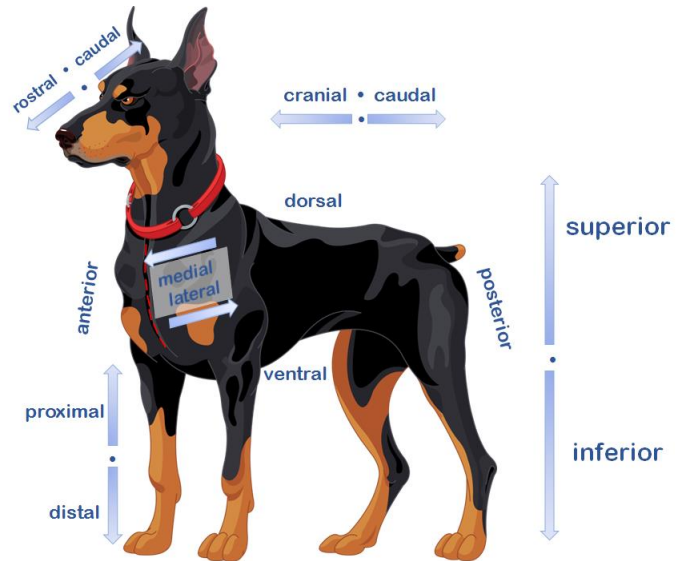
The Grasshopper

“But if you resist and do not let them go, behold I will bring in tomorrow the locust into your coasts.
Exodus 10:4

Introduction

The grasshopper is an animal in the Phylum *Arthropoda*, Class *Insecta*, and Order *Orthoptera*. These interesting insects have large hind legs for jumping, mouthparts for chewing, and two pairs of wings – one veined leathery pair covering a thinner pair beneath. Openings in the abdomen called *spiracles* enable terrestrial breathing. You will first examine the external anatomy. Next you will dissect the grasshopper, finding not only the organ systems indicated in the Dissection Guide from the kit, but also those indicated in the protocol below.

Review the anatomical terms in the figure to the right – these anatomical terms will be used throughout the lab and you will be expected to use them in your terminology.



Learning Objectives:

- Learn the organs that comprise the various systems of the grasshopper
- Describe the external and internal anatomy
- Utilize anatomical terms and directions

Materials Required:

From Biology Kit	Student Supplied
Introductory Dissection Kit	
Grasshopper Dissection Guide	
Grasshopper	

Safety

- Dissection tools are very sharp. Use appropriately and do not leave unattended in the presence of children.

Experiment

The “*Grasshopper Dissection Guide*” has been provided in the kit for you. Follow the instructions in the guide for dissecting the earthworm. Use the guide and your text to locate the features indicated below.

1. Proceed first to dissect the External Anatomy, filling out Table 1 as you do so

2. External Features - HEAD

- Follow the instructions in the Guide on the “**External Anatomy**”
- Identify the structure and function of the following:
 - Ocelli
 - Labrum
 - Compound Eye
 - Maxillae
 - Antennae
 - Labium
 - Mandibles
 - Labial palps
 - Maxillary palp

3. External Features - THORAX

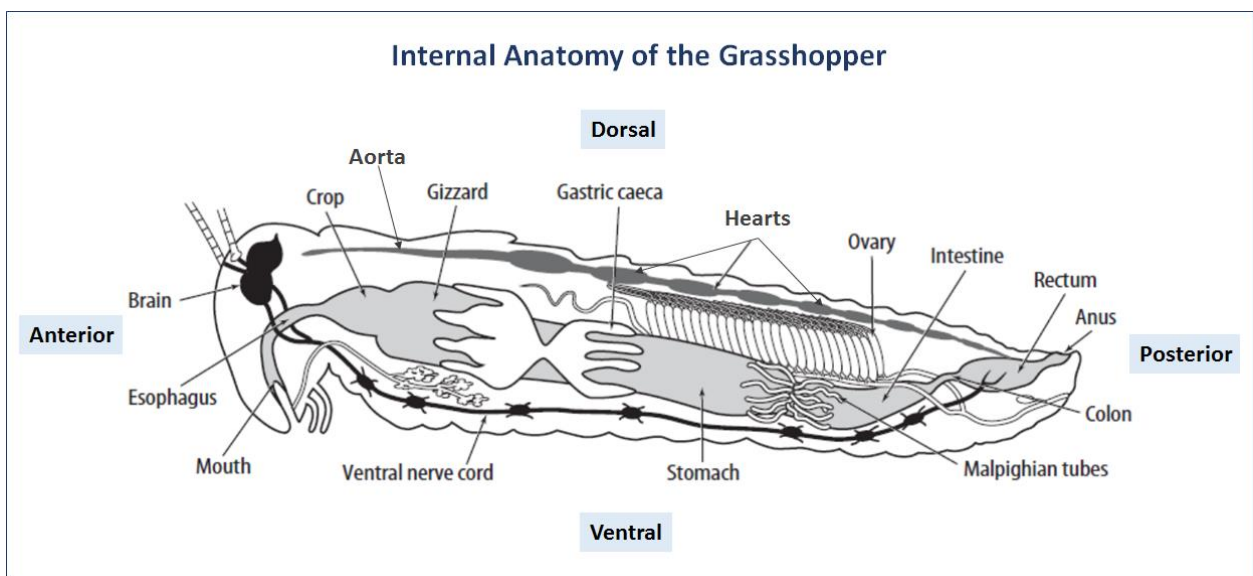
- Follow the instructions in the Guide on the “**External Anatomy**”
- Identify the structure and function of the following:
 - Pronotum
 - Tarsal Spur
 - Femur
 - Tegmina
 - Tibia
 - Hind wings
 - Tarsus
 - Jumping Legs
 - Tarsal Claw
 - Walking Legs

4. External Features - ABDOMEN

- Follow the instructions in the Guide on the “**External Anatomy**”
- Identify the structure and function of the following:
 - 11 segments
 - [Ovipositor]
 - Spiracles (each segment)
 - Tympanum_Segment 1
 - Male or female?

5. Proceed to the Internal Anatomy, filling out Table 2 as you do so

- You will follow both the instructions below and the Dissection Guide for the “**Internal Anatomy**”
- **Note**, you will be asked to find more than the Guide from the kit has included



6. View the labeled picture in order to:

- Determine how the dissected earthworm should look
- Assist you in locating the following anatomical features

7. Circulatory System

- Identify the structure and function of the following:
 - Aorta (the dorsal and anterior blood vessel)
 - Heart (may be able to identify slight enlargements over the stomach and intestine)

8. Respiratory System

- Use the scissors and pin to cut and tease the muscles on a middle segment close to the exoskeleton and near a spiracle
 - Locate the finely branched *trachea* leading to the *spiracles*

9. Nervous System

- Cut through the exoskeleton over the top of the head between the two antennae and the left eye down to the mouth
- Remove the exoskeleton on that side
- Locate the following:
 - Dorsal Ganglion or Brain
 - Fused nerve cords
 - Ventral nerve cord
 - Any nerve attachments going to the antennae or to the eye
- Locate the tympanum on Segment 1 – the tympanum is a crucial sensory organ
 - Identify any ventral nerve attachment going to the tympanum
 - This may be difficult to detect

10. Digestive System

- Identify the structure and function of the following:

<ul style="list-style-type: none"> ▪ Alimentary canal ▪ Mouth ▪ Esophagus ▪ Crop ▪ Anus 	<ul style="list-style-type: none"> ▪ Gizzard ▪ Gastric caeca ▪ Intestine ▪ Rectum
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11. Excretory System

- Identify the structure and function of the following:
 - Malpighian Tubule

12. Reproductive System

- Identify the structure and function of the following:

<ul style="list-style-type: none"> ▪ Coelomic cavity ▪ Testes (over intestines) 	<ul style="list-style-type: none"> ▪ Ovaries (over intestines)
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13. Perform Data Analyses and Conclusions

Lab Report for: _____

Table 1: External Structures and their Functions

Structure	How Many Were There?	Function
Compound Eye		
Ocelli		
Labrum		
Mandible		
Maxillae		
Maxillary palp		
Tegmina		
Tympanum		
Spiracle		

Table 2: Internal Structures and their Functions

Structure	Visual Description?	Function
Trachea		
Dorsal Ganglion		
Gizzard		
Gastric Caeca		
Malpighian tubule		

Data Analysis and Conclusions

1. Identify the 3 main external features of the grasshopper

- a. _____
- b. _____
- c. _____

2. Which of the three regions of the insect's body was most specialized for sensory functions? Explain your answer.

3. Which of the three regions of the insect's body was most specialized for movement? Explain your answer.

4. Compare the circulatory system of the earthworm with that of the grasshopper.

5. Compare the nervous system of the earthworm with that of the grasshopper.

6. Explain how you identified the sex of your earthworm