

ADVANCED PLACEMENT[®] BIOLOGY

==== Laboratory 11 ====

Animal Behavior

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TEACHER'S MANUAL

CAROLINA

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LABORATORY 11. ANIMAL BEHAVIOR

Objectives

In this laboratory, you will

- observe various aspects of the behavior of a terrestrial isopod
- conduct experiments examining the responses of isopods to various environmental factors
- design and conduct an investigation of animal behavior
- hypothesize as to the reasons for the behaviors you observe

Required Knowledge

Before beginning this laboratory, you should understand

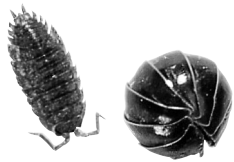
- the concept of distribution of organisms in a resource gradient
- the difference between kinesis and taxis

Expectations

At the completion of this laboratory, you should be able to

- describe some aspects of animal behavior, such as orientation behavior
- understand that behaviors are adaptations of an animal to its environment

Background



Armadillidium vulgare;
Porcellio laevis

Isopods: Pill bugs and Sow bugs (*Armadillidium vulgare*; *Porcellio laevis*)

Terrestrial isopods are land dwelling crustaceans, commonly known as sow bugs or pill bugs. They have many other common names: potato bugs, wood lice (no relation to body lice), and roly-poly are just a few. Related to lobsters, crabs, and shrimp, terrestrial isopods breathe with gills. Although similar in size, color, and life cycle, pill bugs and sow bugs are different. When threatened, pill bugs can curl up into a tight ball for protection, while sow bugs either attempt to flee or remain perfectly still, appearing to be dead.

Ethology is the study of animal behavior. Many behaviors involve movement of the animal within its environment. In this exercise you will investigate some innate (inherited, as opposed to learned) behaviors of isopods.

Orientation is the process by which animals position themselves with respect to spatial features of their environments. **Taxis** involves the turning of an animal's body relative to a stimulus. The animal may turn away from, toward, perpendicular to (etc.), the stimulus. The turning may or may not be followed by a corresponding movement of the animal in relation to the stimulus. **Kinesis** is random turning or movement of an animal in relation to a stimulus. Consider the following experiment: a researcher places a dead, rotting mouse in the center of a test surface of 1 m². The researcher then places a carrion beetle (an insect that eats dead animal tissue) somewhere on the test surface and observes. The beetle crawls forward for three seconds, turns, and crawls in a different direction for three seconds, and so on. The researcher concludes that the beetle is moving randomly in relation to the dead mouse. Continued observation reveals that the beetle crawls faster (and covers more ground) when it happens to turn in the direction of the dead mouse. In addition, the beetle crawls more slowly (and covers less ground) when it happens to crawl away from the mouse. In this way, the beetle's random movements will eventually bring it to the dead mouse, at which point other behavior patterns, such as feeding, will take over.

Exercises 11A: General Observation of Isopod Behavior**Procedure**

1. Place a small amount of bedding into a petri dish or plastic cup. Use a sorting brush to transfer 5 isopods into the dish. Try to choose isopods of similar size.
2. Observe the isopods for 10 minutes. Make notes on their general appearance, movements, and interactions with each other. Note whether they seem to stay in one area, or if they move sporadically or continuously. Note any behaviors in which two or more isopods interact. Make observations without disturbing the animals in any way. Do not move the dish, make loud noises, or subject the animals to bright light. The goal is to observe their behavior while influencing it as little as possible. Record your observations below.

3. In the space provided below, make a detailed sketch of an isopod. Label your drawing.

Exercises 11B: Orientation in Isopods

Procedure

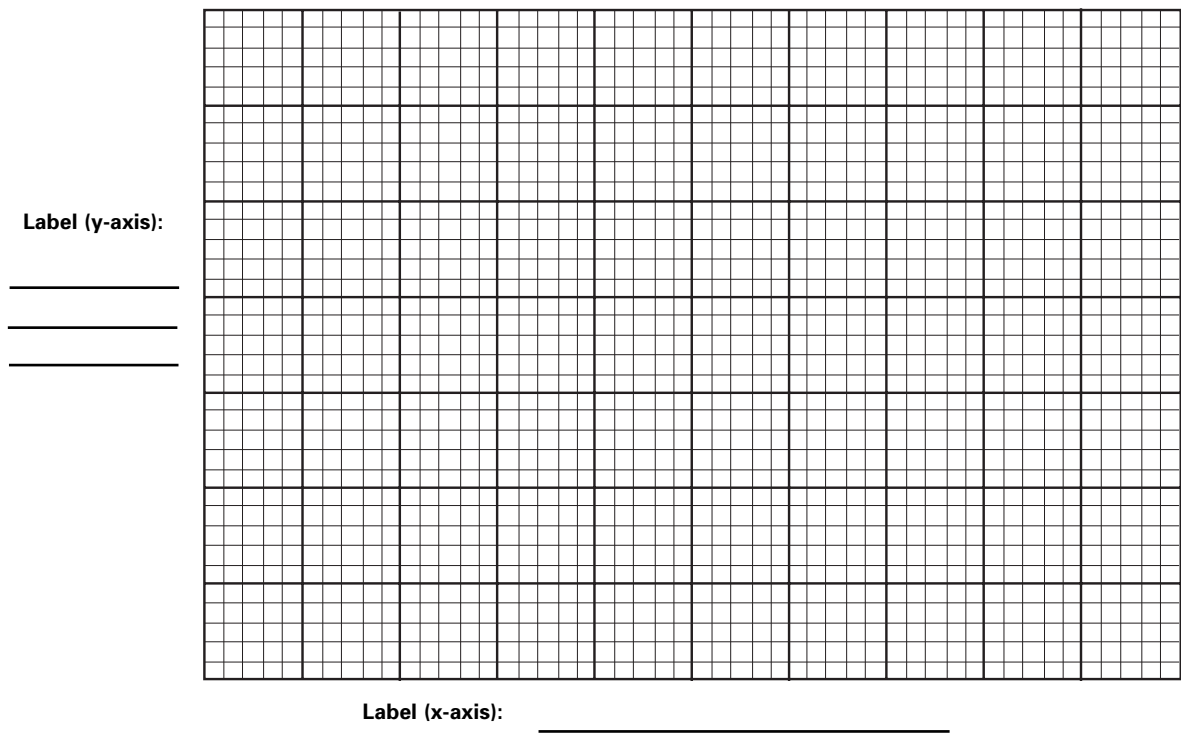
1. Place clean filter paper into each side of your Choice Chamber.
2. Using a dropping pipet, saturate the filter paper on one side of the chamber. Pour off any excess water so that it cannot run into the other side of the chamber and moisten the paper there.
3. Use a sorting brush to transfer five (5) isopods to each side of the chamber. Put on the lids.
4. Count and record, in Table 11.1, the number of animals on each side of the chamber every 30 seconds for 10 minutes. Continue to record, even if the isopods all move to one side or stop moving at all.

Table 11.1 Orientation in Isopods

Time (min:sec)	# in Wet Chamber	# in Dry Chamber	Other Notes
0:00			
0:30			
1:00			
1:30			
2:00			
2:30			
3:00			
3:30			
4:00			
4:30			
5:00			
5:30			
6:00			
6:30			
7:00			
7:30			
8:00			
8:30			
9:00			
9:30			
10:00			

- 5. Return your isopods to the stock culture or separate holding area.
- 6. Generate Graph 11.1 using two sets of data: the number of isopods on the wet side of the chamber and the number of isopods on the dry side of the chamber over time. For the graph, determine the following:
 - a. The independent variable is _____.
(Use to label the horizontal x-axis.)
 - b. The dependent variable is _____.
(Use to label the vertical y-axis.)

Graph 11.1 Title: _____



Questions

1. Based upon your observations, do isopods orient with respect to moisture in the environment? Explain your answer.

2. If you answered “yes” to Question 1 above, was the orientation achieved through taxis or kinesis? Support your answer.

3. How might this behavior be advantageous to isopods?

Exercises 11C: Student-Designed Experiments on Isopod Behavior**Procedure**

- Select one factor listed below to investigate.

Factor	Conditions
temperature	cool vs. warm
light	light vs. dark, or light vs. shade
pH	low pH vs. high pH
substrate (surface)	smooth vs. rough

- Your teacher will now point out the materials available for conducting your investigation. In designing your experiment, be careful not to injure the isopods. Lamps placed too close to the organisms, for example, may generate dangerous heat.

1. State the factor to be tested: _____

2. Based on laboratory experience with isopods, state the hypothesis to be explored:

3. List the materials used in the experiment:

4. List the procedure to be followed (step-by-step):

5. Describe the data that will be collected and how the results will be displayed. (Use Graph 11.2, on page 12, if appropriate.)

- 6. Perform the experiment.
- 7. Return the isopods to the stock culture.

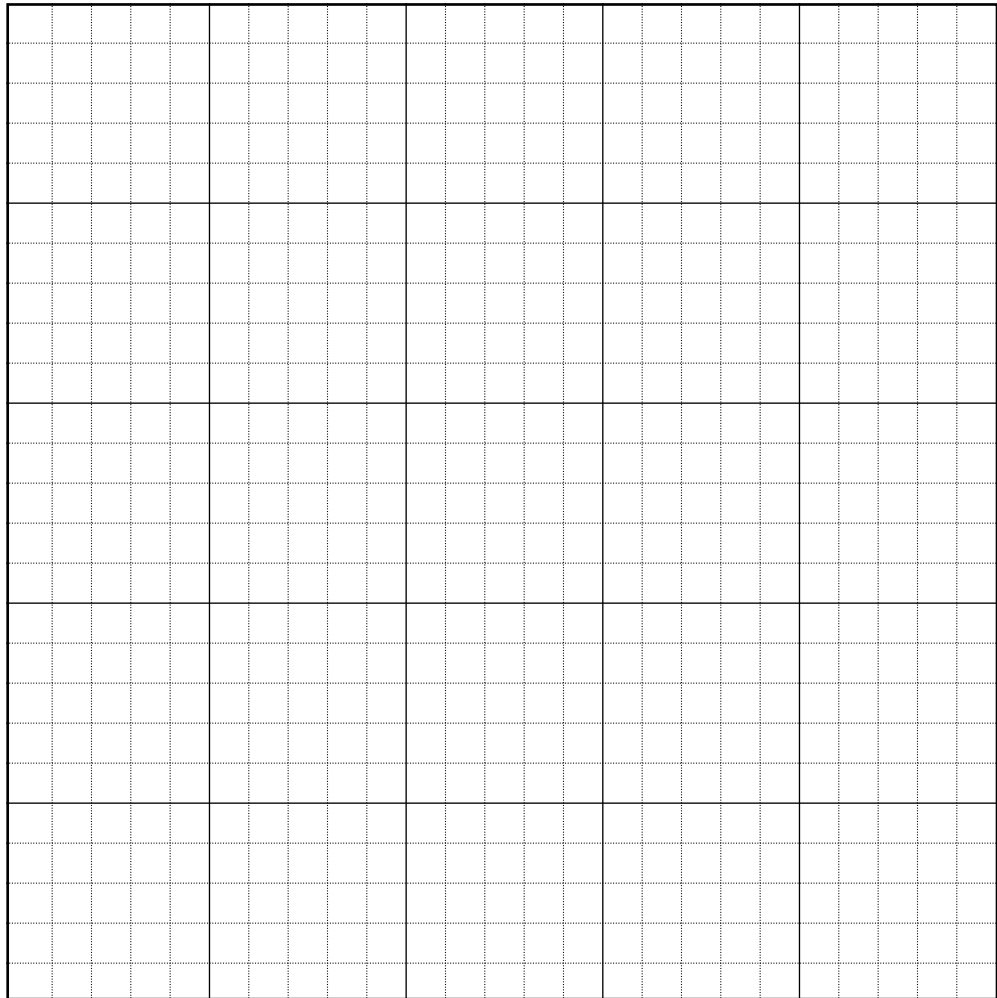
8. State your conclusions concerning the hypothesis tested.

9. Obtain results from all groups in your class for both the kinesis experiment and the designed experiments.

Graph 11.2

Title: _____

Label (y-axis):



Label (x-axis): _____

Questions

1. Considering all of the factors tested by your class, what type of environment do isopods seem to prefer?

2. How do you think isopods locate appropriate environments?

3. If you suddenly turned a rock over and found isopods under it, what would you expect them to be doing? If you watched the isopods for a few minutes, how would you expect to see their behavior change?
