Student Names: _____Worm Name: _____ Science _____

LAB: Observing Planarians

Introduction:
Planarians are invertebrate animals belonging to the Phylum Platyhelminthes (flatworms). You can easily find planarians on your own. Shake pond weeds into a pan or turn over stream rocks and look carefully at the rocks surfaces. You can also *collect* flatworms on your own. Put a small pellet of canned pet food in an old nylon stocking. Secure that bag in a stream bed or shore overnight. In the morning, you may find a collection of flatworms crawling over the bag!

In this investigation, you will observe planarians and identify their structures and behavior. You will also conduct a few experiments.

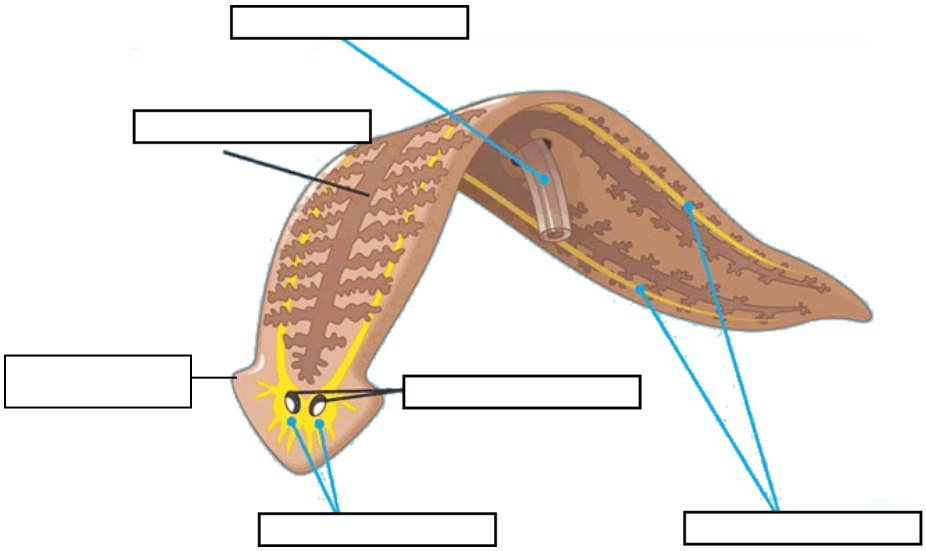
Planarian Anatomy:
Planarians have a head with a pair of pigmented **eyespots** and a pair of side projections called **auricles**. These auricles have sensory cells that respond to chemicals and/or touch. When the planarians move, they "test" the environment ahead of them by oscillating the head region. The gliding locomotion is powered by **cilia** that cover the animal's ventral surface and is directed by muscular movements of the body. Slimy mucus is secreted by glands on the underbelly of the body and provides traction for the cilia.

The head region also contains **ganglia**, which is not a true "brain", but rather a simple nerve bundle, that controls the organism's various functions. The ganglia are connected to the **ventral nerve cords** that relay messages from one end of the planarian's body to the other. Rather than a **mouth** at the head like other organisms, the planarian mouth is a small hole near the center of the ventral surface. The mouth leads into a central cavity containing the **pharynx,** which in turn, leads into the large **gastrovascular cavity**. When the planarian encounters food, the pharynx protrudes through the mouth, and a slight sucking action draws food particles into the gastrovascular cavity. The pharynx is often referred to as the feeding tube.

Planarians can reproduce both asexually and sexually. Sexual reproduction is seasonal, and reproductive organs develop as that season approaches. Both male and female organs are present in each worm, but the individuals mate with each other and exchange sperm.

> **This will count as a TEST Grade to hold students accountable to following directions and proper, careful lab technique. Dead planarian will result in the loss of 10 points from the lab grade.**
>
> You may make up the 10 points for your dead planarian by composing a 1 paragraph (4-5 sentences) explanation as to **why** you think your planarian died. You need to give an honest evaluation as to the circumstances that led to your planarian's demise.

Part 1A: Anatomy and Physiology of your worm. Label the planarian's structures with the terms above.



Materials:

Petri dish Hard-boiled egg (yolk) spring water pipette scalpels stereoscope marker small metric ruler ice - optional

Directions: In the next few sections, you will be observing planarian responses to stimuli.

Part 1B: Feeding

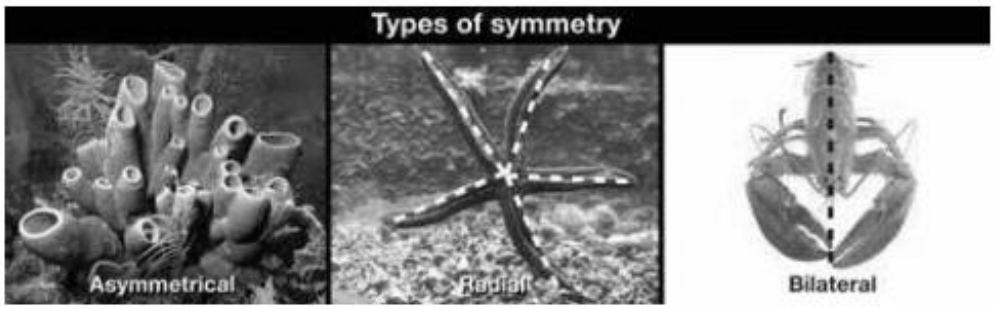
Watch the video, "How Planarian Eat," on our web site. Next, your teacher will place portions of hard-boiled egg yolk in the main container of Planarian.

TABLE 1. Feeding Observe the planarians' reactions. This may take a few minutes. Record your observations in table 1.

Complete Table 1 on your answer sheet.

Part 2: Observing your planarian

1. The flatworm is the freshwater planarian, known as **Dugesia**. You will receive a small petri dish with a flatworm inside it. These worms are hermaphroditic, so you can give it either a boy or girl name. Write it on the petri dish and your science class period. **Record all of your answers and data for Part 2 in Table 2.**
2. What type of symmetry does this worm have? Use the diagram below to answer.



3. **Measure** your planarian. You can do this by first placing a thin ruler under the petri dish. Then, remove some of the water in the dish with a pipette and wait for the worm to stretch out. Measure the length of the worm in *millimeters*. When finished, replace the water if needed (SPRING WATER ONLY).
4. **Write the length on the board**. When all the lengths are written down, determine the average planarian length for your class.

Part 3: Observing movement and behavior. Record your observations in Table 3.

1. Observe the planarian for five minutes. Does the planarian seem active or passive? How does it move? Does it swim or creep?
2. Where in the dish does the planarian spend most of its time?
3. Make a current in the water with a pipette. How does the planarian react?
4. Turn the light off to the dissecting scope for at least 60 seconds. Then turn the light back on. How does the planarian react?

Complete Table 3: Planaria Movement and Behavior

Part 4: Observing Planarian "handedness." Record your observations in Table 4.

Like you, Planarians actually display a handedness, being right or left handed. You can discover whether your worm is right or left handed by creating a current underwater causing the planarian to flip over on its dorsal (back). Watch which way it recovers. If it rolls to the right, it is right handed, if it rolls to the left, it is left handed. Do five trials to determine the handedness of your planarian and write results in the table below.

Complete Table 4: Handedness

Part 5: To do the Planarian Regeneration experiment:

1. Cuts must be precise and clean through. You can slow down your worm by removing some of the water until the planarian is mostly un-submerged.

2. **Make a Prediction:** How long do you think it will take (in days) for your planarian to completely regenerate? _____

3. **Draw the worm and a dotted line for the type of cut** you will do for this experiment: Horizontal? Vertical? Near the head? Multiple cuts?

4. Make the cut with the scalpel and then record your first observations in the Daily Regeneration Observation table on the next page.

Complete Table 5: Regeneration Observations

Analysis and Conclusion

Directions: Answer the multiple choice questions on your lab answer sheet.

Exploring Further—Regeneration

Watch the Planarian Regeneration video from Exploratorium.

a. If time permits, you can explore how planarians reproduce. Planarians are hermaphrodites. Define *hermaphrodite*.

_____

_____

_____

b. Planarians can also reproduce by regeneration. Define *regeneration*. Is this method of reproduction sexual or asexual?

_____

_____

_____

_____

Exploring Further—Regeneration and stem cells

c. At minute 1:59 in the video, what does the white area indicate in the tissue of the animal?

d. Watch this video on Stem Cells from Exploratorium. **Why are scientists interested in stem cells?**