

Phylum Platyhelminthes: The Planarian

Name: _____

Per. _____

Date: _____

Part I : Anatomy / Physiology of the Planarian

NOTE: All questions below are to be recorded into your lab book.

Flatworms

The flatworms are flattened dorsoventrally. The term dorsal refers to the upper surface and ventral refers to the lower surface of the animal. Flatworms have a definite head end and posterior end and they also have a right and left side.

Planaria

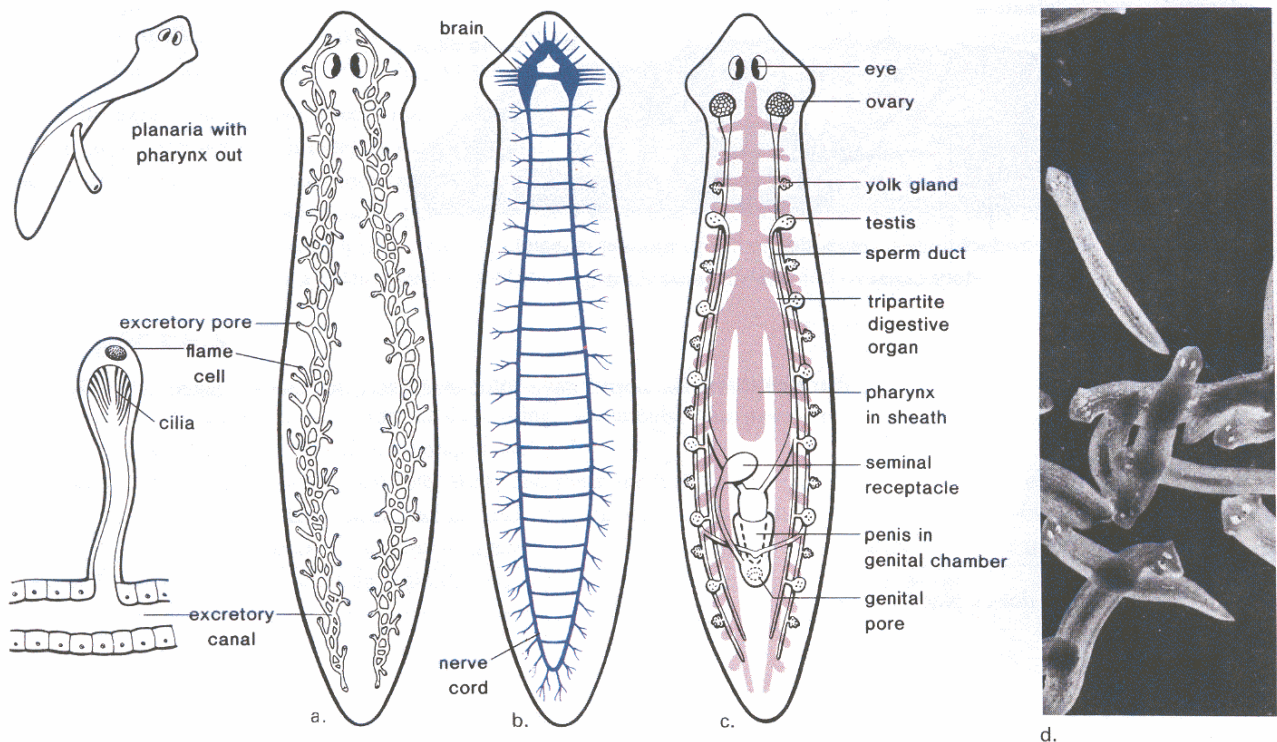
Planaria (unlike most flatworms) live in fresh water, such as mountain streams; some are found in fairly moist places under stones and logs. Figure 27.6 describes their anatomy. The **eyes** are sensitive to light but do not form images. The **auricles** contain nerve endings sensitive to touch and chemicals. The mouth is located at the end of the **pharynx**, which can be extended from the midventral surface of the body when a planarian is feeding.

Observation of Planaria

Living Planaria

Examine a live specimen of a planarian in water in a watch glass. Note the shape of the body and head. Place a small piece of meat, such as hamburger, in the watch glass and carefully watch the reaction of the worm.

Figure 27.6 Anatomy of a planarian. **a.** Excretory system with flame cells shown in detail. **b.** Nervous system (note ladder appearance). **c.** Reproductive and digestive organs. **d.** Photomicrograph of numerous planaria.



Model or Whole Mount of a Planarian

Examine a model (or whole mount) of a planarian showing the branched gastrovascular cavity.

In what way is the digestive tract similar to that of *Hydra*? _____

In what way is it different? _____

Would you expect an animal with this type of digestive tract to have a circulatory system? _____

Why or why not? _____

If you are examining a model, note the organs displayed in figure 27.6. There is a tubular system of excretory canals terminating in ciliated cells that collect water and wastes.

Why is it said that a planarian has a **flame-cell** excretory organ? _____

There is a pair of nerve cords connected by transverse fibers. Why is it said that a planarian has a **ladder-type** nervous organ? _____

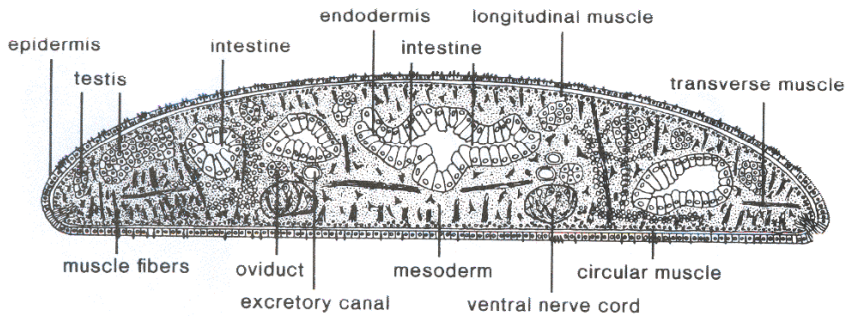
Is a planarian hermaphroditic (having both male and female organs)? _____

Cross Section of a Planarian

Examine a cross section of a planarian (fig. 27.7) using either a microscope slide or the model. Locate the thin, compact epidermis derived from ectoderm and the spongy endodermis derived from endoderm. The endodermis lines the various branches of the digestive tract. Notice that the outer and inner layers are separated by a third layer, derived from mesoderm. This middle layer consists partly of muscle fibers that run in various directions. It is located in between the various organs.

Does your slide examination indicate that there is no space around the internal organs? _____

Figure 27.7 Cross section through anterior end of a planarian as it would appear under the microscope.



Discussion

Using planarians as an example, observe that free-living flatworms have some characteristics that are listed as primitive and some that are listed as advanced in table 27.1.

What type of body plan does a planarian have? _____

Does a planarian have bilateral symmetry? _____

How do you know? _____

How many germ layers does a planarian have? _____

What are they? _____

Does a planarian have the tissue or organ level of organization? _____

Is a planarian an acoelomate? _____

Explain: _____

PLANARIA

Planaria are small (20 millimeters or less), nonparasitic flatworms with simple eyes that look crossed. These eyes have no lens and probably cannot produce much of an image but do allow the worm to detect directional light and avoid it by hiding under rocks, logs, and so forth. Planarians live partly as scavengers and partly as predators on tiny crustaceans and similar animals. They also have amazing powers of regeneration. Cut one in half and each half will regenerate the missing part, resulting in two worms.

Color the parts of the whole worm in the upper drawing and structures A through G in the cross section below it. Color the corresponding titles with the same colors. Then continue reading below.

The outermost layer of the body wall is a single layer of cells, the *epidermis*. On the flat, ventral (under) surface, the *epidermis* has numerous cilia, which propel the worm along the bottom. A *genital pore* and a mouth with an *extendable pharynx* are also found on the ventral surface. Just deep (internal) to the *epidermis* are two muscle layers, the outer one *circular* (going around the body) and the inner one *longitudinal* (running lengthwise). The action of these muscle layers can be coordinated to produce an undulating swimming motion.

Instead of the jellylike mesoglea found in coelenterates, flatworms have a true third layer of connective tissue called *mesenchyme*, which fills the spaces between the internal organs. In fact, it is certain cells of the *mesenchyme* of the embryo that develop into the muscular, excretory, and reproductive systems. Within the *mesenchyme* are various types of *gland cells* that secrete mucus and various adhesive substances through *ducts* to the surface of the *epidermis*. The *mesenchyme* also contains a number of *formative cells* that function in regeneration of damaged parts.

Color structures H through N¹ in both the cross section and the plan view at the lower left, along with their corresponding titles. Then continue reading below.

All four of the organ systems illustrated at the bottom of this plate are bilateral (exist on both sides of the

worm). This can be seen in the cross sectional view. They are shown separately and only on one side for the sake of clarity. The excretory system contains *flame cells*, so called because the beating of their cilia resembles the flickering of a flame. *Flame cells* collect excess water and certain wastes from surrounding tissues and transport them into the cavity, where the cilia propel them down the *excretory ducts* and out through the *excretory pores* in the upper (dorsal) surface.

The digestive system includes a *mouth* with two-directional traffic (food and waste) passing through. The *pharynx* can be extended through the *mouth* some distance to take in food. The highly branched *intestine* has three extensions (diverticula), one anterior and two posterior.

The nervous system is of the "ladder" type, with paired *nerve cords* running down each side of the body giving off *branches* to neighboring muscles/tissue and to the opposite cord. Concentrations of nerve cells at the head end form the *cerebral ganglia*, which serve as a rudimentary brain.

Now color the remaining structures and their corresponding titles. Then read below.

The reproductive system contains organs of both sexes in the same individual (hermaphroditism; hermes = male; aphrodite = female). However, planaria do not fertilize themselves but mate with one another. Sperm cells are produced in numerous *testes*, distributed along both sides of the worm, and pass down the *sperm ducts* to the *seminal vesicles*. In copulation, the *penis* of each worm is protruded out through its own *genital pore* and through the *genital pore* of its mate into the *vagina*. Sperm cells are transferred to the *copulatory sac* (seminal receptacle), where they are stored. After copulation, the sperm cells become active and migrate up the *oviduct*, where they fertilize the egg cells (ova) produced by the two *ovaries*. *Yolk glands* produce yolk cells, which are enclosed with the fertilized egg cells within a sticky capsule. The egg capsules are then passed out through the *genital pore* and attached to the undersides of rocks or other submerged objects, where they hatch out into small planaria after a few weeks.

PLANARIA.

BODY WALL*

EPIDERMIS_A

GENITAL PORE_B

MUSCLE LAYERS*

CIRCULAR_C

LONGITUDINAL_D

MESENCHYME_E

FORMATIVE CELLS_F

GLAND/DUCT_G

EXCRETORY SYSTEM*

FLAME CELLS_H

EXCRETORY DUCT_I

EXCRETORY PORE_J

DIGESTIVE SYSTEM*

MOUTH_K

PHARYNX RETRACTED_L

PHARYNX EXTENDED_{L'}

INTESTINE_M

NERVOUS SYSTEM*

CEREBRAL GANGLIA_N

NERVE CORD/BRANCH_{N'}

REPRODUCTIVE SYSTEM*

MALE ORGANS*

TESTIS_O

SPERM DUCT_P

SEMINAL VESICLE_Q

PENIS_R

FEMALE ORGANS*

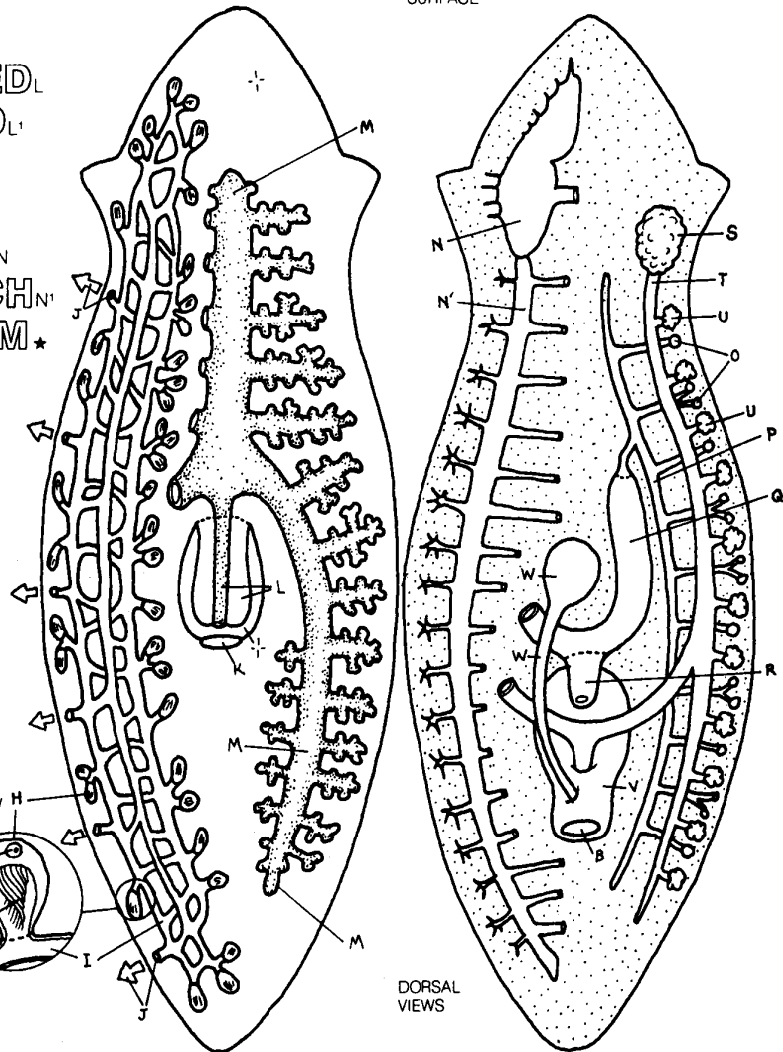
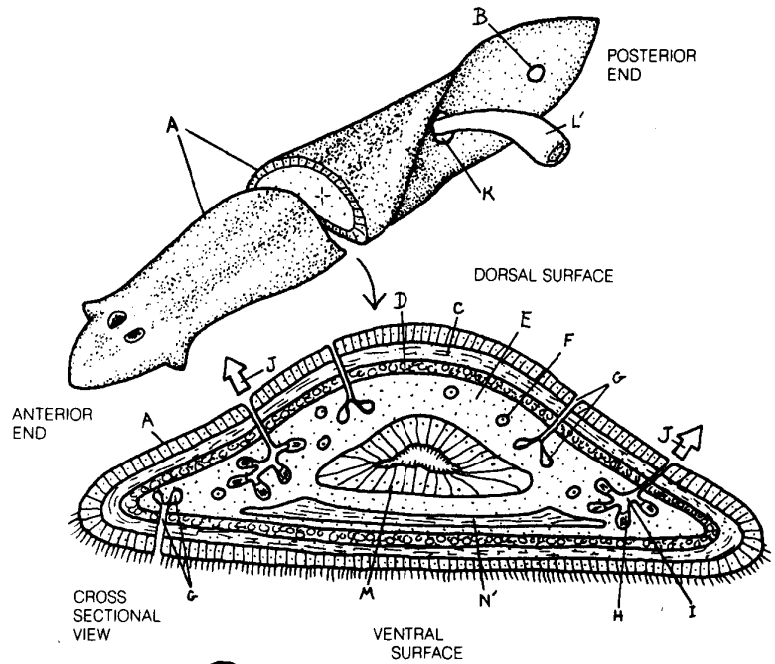
OVARY_S

OVIDUCT_T

YOLK GLAND_U

VAGINA_V

COPULATORY SAC_W



Planarian Instructions:

1. Carefully remove 1 planarian (for each group) from the culture jar and place it w/ a small amount of H₂O in a large petri dish.
2. Under low power microscope, dissecting microscope, or hand magnifier, Observe, and diagram your planarian in the space below. Be sure to label all significant structures. USE PENCIL ONLY.

