Name(s)_____

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Date_____ Pd_____

Earthworm Dissection Lab

PURPOSE:

The phylum *Annelida* contains segmented animals of great importance. The classes of organisms that fall into Phylum Annelida include:

- _____ (Sandworms)~ have fleshy outgrowths called parapodia extending from its segments; are marine-dwelling; have many bristles.
- _____ (Leeches)~ flattened body; no parapodia; suckers at anterior and posterior ends; external parasites.
- _____ (Your Dissection Critter!)~ Head not well developed; no parapodia; terrestrial and fresh water forms.

We study the annelids to learn structures and functions of the first truly segmented animals. Advances made in this group are retained through evolution in most all higher types of animals.

CLASSIFICATION OF EARTHWORM:

Kingdom - *Animalia*
Phylum - *Annelida*
Class - *Oligochaeta*
Genus - *Lumbricus*
Species - *terrestrias*

MATERIALS: A preserved specimen, dissecting pan, scalpel or razor blade, probe, hand lens, scissors.

THE EARTHWORM DISSECTION

For ease in identifying organs or corresponding parts in the earthworm, numbers will be used. These will refer to segments counting from the anterior end.

A. EXTERNAL ANATOMY

Note again the uniform segmentation of the worm and the lack of conspicuous appendages. The number of segments usually exceed 100 in number. How many segments does your worm have? _____

The dorsal surface is pigmented and marked with a dark line, the dorsal blood vessel. The ventral surface is pale and somewhat flattened.

A swollen zone (32-37) near the anterior end is the clitellum, a glandular area which secretes a cocoon in which the young earthworms develop.

The mouth opening, overhung by a small prostomium (again, not a true segment) devoid of visible sense organs, is in the ventral region of the first segment, the peristomium. An anus is in the center of the last segment.

By running the tip of the finger forward over the ventral surface of the body, thin bristles, chaetae, may be felt. These are moved by internal muscles and assist in locomotion. Careful examination will reveal these to occur in pairs, four pairs to each segment; two pairs are ventral, the other two pairs are nearly lateral in position.

Two sperm grooves run between the inner and outer rows of chaetae from the clitellum to the sperm duct openings.

Other openings to the surface should now be identified.

1. Sperm duct opening (15) are conspicuous ventral slits on the ventral surface.
2. Oviduct opening (14) are small apertures just lateral to the ventral row of chaetae.
3. Seminal receptacle openings (in grooves between 9 and 10, and 10 and 11) are small slit-like apertures in line with the lateral row of chaetae. Low power magnification will assist you in seeing these and the next two types of openings.
4. Nephridiopores are external openings of the excretory organs, the nephridia; the pores, not present on the first and last few segments, like just anterior and lateral to the ventral row of chaetae.
5. Dorsal pores are openings from the coelom to the outside. These lie in the dorsal line between segments.

B. INTERNAL ANATOMY

- Place a pin through the posterior end of the worm which must be dorsal side up in the dissecting pan.

- Make a shallow initial incision with scissors about 1" behind the clitellum through just the body wall. **Do not cut deep or the gut will be cut.** Now continue cutting in the dorsal line forward; pinning out the flaps after severing the septa which join the intestine and the body wall. Note the large body cavity, a coelom, surrounding the organs.

Structures which are readily apparent from the dorsal side will now be identified.

1. The gut is a tube running from the mouth to the anus. It is regionally differentiated, beginning anteriorly in a buccal cavity (1-3), followed by a pharynx (4-5) made conspicuous by muscle fibers radiating from its wall. Behind the pharynx is a narrow **esophagus** (6-9) obscured by hearts and some reproductive organs. The wall of the esophagus bear some small glands. The esophagus joins a thin-walled storage organ, the **crop** (15-16), behind which is the thick- walled grinding organ, the **gizzard** (17-18). The stomach- intestine runs from the gizzard to the **anus**. Note that the stomach-intestine is constricted by each septum. These constrictions together with a dorsal fold in the gut increase the surface for secretion and absorption.

2. **Circulatory system:** The contractile dorsal blood vessel, in which the blood flows anteriorly, should be traced forward to segments 7 - 11 where it joins five pairs of aortic arches or "hearts" (one pair in each of the five segments). The aortic arches are barostatic and are also contractile. They force blood under steady pressure into the ventral blood vessel. It distributes blood to most of the organs of the body. If the gut is transected near the clitellum and lifted, the ventral blood vessel will be seen running beneath the gut.

3. The **reproductive system** consists of conspicuous and inconspicuous parts. Remember the earthworm is **monoecious**.

a. Male System
The three pairs of large, whitish organs (9-12) are **seminal vesicles** in which the sperm ripen. By carefully removing the gut and circulatory system up to segment 5, the full extent of these organs may be seen. **Testes** are small and buried in the bottom of the vesicles. They will not be visible. Fine tubes, the ***vasa deferentia***, run from the vesicles to the male pores on 15.

b. Female System
Two pairs of globular organs (9&10), the **seminal receptacles** store sperm received from another worm at the time of copulation. Tiny, conical **ovaries** hang, near the midline, from the anterior septum of segment 13 and the egg funnel and egg sac are in the posterior septum of the same segment. All specimens may not show these organs well. An oviduct leads from each egg sac to the openings seen on segment 14.

4. Excretory system: Coiled tubes, the **nephridia**, lie against the body wall.

5. Nervous system: Locate the tiny **brain**, a two-lobed mass, on the dorsal surface of the pharynx. Note the ventral nerve cord consisting of a chain of ganglia with 3 pairs of lateral nerves in each segment.

CROSS SECTION OF THE EARTHWORM

Make a cross section of your specimen with a razor blade or sharp scalpel in the posterior region. Look at the cut end and locate the **body wall, *coelom, gut, and the nerve cord.***

IF TIME, examine a prepared slide and identify the structures in greater detail.

1. Body wall:
   a. Cuticle - a thin secreted layer on the outside.
   b. Epidermis - a single layer of cells beneath the cuticle
   c. Circular muscle - a layer of cells beneath the epidermis which are responsible for contraction
   d. Longitudinal muscle - a layer of cells responsible for elongation of worm
   e. Peritoneum - a thin layer at the inner ed of the longitudinal muscle

2. ***Coelom*** - this is the large space often containing sections of the nephridia.

3. Stomach-Intestine:
   a. The dorsal wall of the gut is infolded to form a **typholosole** which increases the gut surface area.
   b. The outer layer of the gut is modified peritoneum called chloragogue layer.

c. Longitudinal muscle
d. Circular muscle
e. Intestinal epithelium - the layer lining the lumen. The cells are tall (columnar) and ciliated.

4. Ventral Nerve Cord

5. Blood Vessels: a. Dorsal blood vessel
   b. Ventral blood vessel

~ANSWER THE FOLLOWING QUESTIONS~

1. What does the term Annelida mean? _____

2. What class does the earthworm belong to? _____

3. Is "dorsal" front or back? _____

4. What is the term for "side"? _____

5. What are "setae"? _____

6. What do earthworms eat? _____

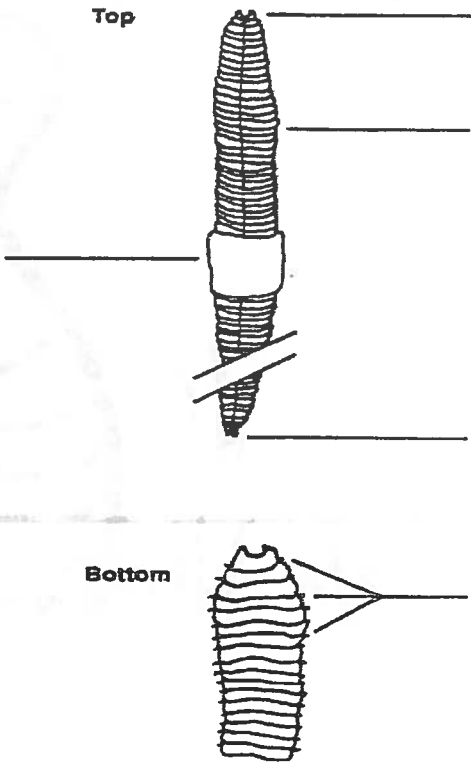
7. How do they breath?
   _____

8. What type of circulatory system do earthworms have? _____

9. What is another name for hermaphroditism?
   _____
   How do they mate this way?
   _____

10. Label the diagram using the following terms:

Anterior	Posterior	Lateral
Clitellum	Ventral	Dorsal



11. Why is it important NOT to make a deep cut when dissecting an animal?

_____

_____

_____

12. What is the flow of food material from consumption to excretion in an earthworm?

_____

_____

13. Describe 2 ways an earthworm's body is adapted to life in the soil:

- _____
- _____

14. If cutting open the intestine, what would you expect to find inside? _____

_____

15. Why do earthworms always seem to "come out" when it rains?

PLEASE COMPLETE THE ATTACHED DIAGRAM

What do you think of dissections so far?

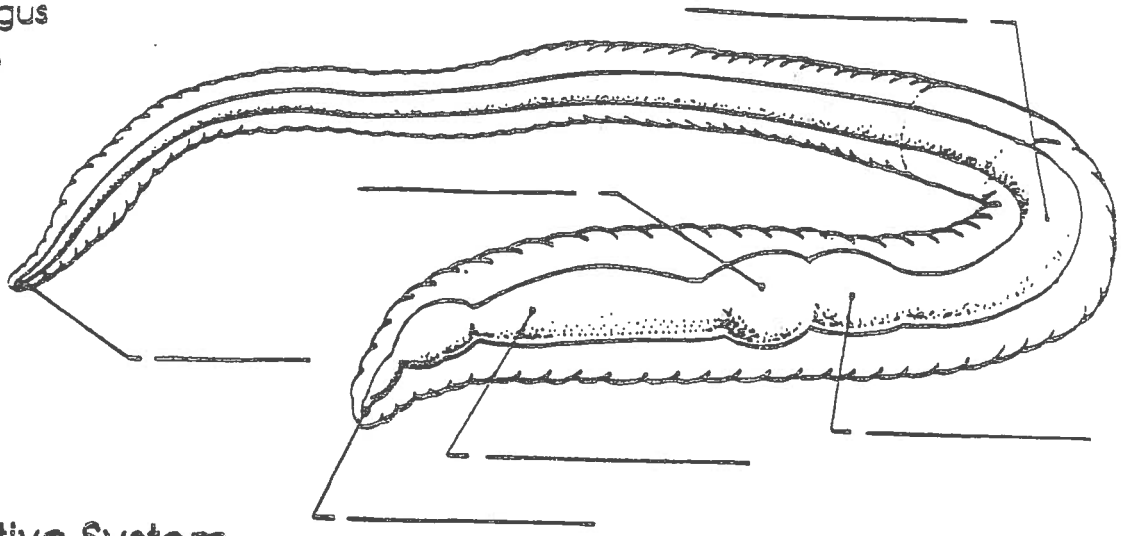
THE EARTHWORM

Name _____

Digestive System

Label the following parts of the digestive system of the earthworm.

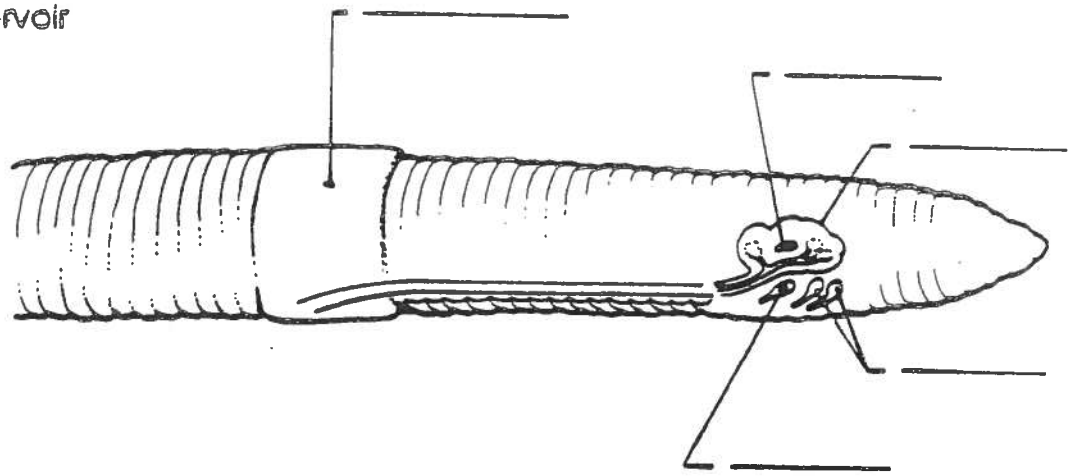
a. crop
b. esophagus
c. intestine
d. mouth
e. anus
f. gizzard



Reproductive System

Label the following parts of the reproductive system of the earthworm.

a. sperm receptacle
b. testis
c. sperm reservoir
d. ovary
e. clitellum



Fill in the blanks with the correct answers.

In the earthworm, after food enters the mouth, it passes through the _____ and is then stored in the _____. From there, it passes to the _____, where it is mechanically broken down by grinding. After this, it is chemically broken down in the _____. Undigested material is egested through the _____. Since an earthworm produces both eggs and sperm, it is considered to be a _____. However, an earthworm _____ self-fertilize.