
EXERCISE 9 MOLLUSCA-II – *PILA*: EXTERNAL FEATURES, DISSECTION AND PREPARATION OF TEMPORARY MOUNT OF RADULA

Structure

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9.1 INTRODUCTION

Pila is a **Mollusc** belonging to the class **Gastropoda**. *Pila* is found in India, Myanmar, Sri Lanka, Thailand, Malaysia, Indonesia, Vietnam, Philippines and Africa. It is commonly called as **apple snail**. There are many species found in Indian subcontinent and the one, which is commonly used for studies, is *P. globosa*. It is found in fresh water ponds, pools, lakes and sometimes in rivers. *Pila* is an **amphibious animal** and seeks a habitat with plenty of aquatic vegetation. You should recall your knowledge about mollusca which you have studied in Units 6 and 7 of LSE-09.

Objectives

After doing this exercise, you should be able to:

- point out, describe and draw the external features of shell of *Pila*,
- break open the shell of *Pila* in order to observe the external features of the body,
- to identify the parts and display them, and draw their diagram, describe the location of various organs in the mantle cavity,
- dissect, expose, display, flag label as well as draw the nervous system of *Pila*,
- locate the buccal mass, take out and prepare a temporary mount of radula, and
- draw a labelled diagram of radula.

9.2 MATERIAL REQUIRED

1. Dissecting tray
2. Dissecting instruments
3. *Pila* (preserved specimens)
4. Table lamp
5. Watch glass
6. Dropper
7. Glass slides
8. Cover slips

9. Dissecting microscope
10. Glycerin
11. Water
12. Blotting paper
13. Common pins
14. Black paper
15. White paper

9.3 EXTERNAL FEATURES OF *PILA* (ENTIRE)

You will get a preserved *Pila*. You wash it thoroughly to remove the formalin and then put it in the dissecting tray.

As you have already read, *Pila globosa* is a Mollusc belonging to class Gastropoda. The animal has a tough outer shell and the soft parts of body are protected inside this shell. Let us now identify the following features of *Pila*.

9.3.1 Shell

The shell of *Pila* is moderately thick, has globose shape and is unilocular i.e. it has one single continuous cavity but coiled around a central axis in a right handed (dextral) spiral. The structure of the shell is as follows:

1. The top of the shell is called **apex** which is the point of **origin** of shell.
2. The coils of shell are called **whorls** and the apex has the **smallest** and oldest whorl, the **protoconch**. Below the apex is a spire of successively larger whorls, 6% in number, called the **teloconch**. The last whorl is the largest and is called the **body whorl**. The whorl just before the body whorl is called the **penultimate whorl**.
3. The whorls are separated externally from each other by lines, which are called the **sutures**. The whorls are connected to each other internally.
4. The central axis around which the whorls coil is called the **columella**. This is a hollow structure and its opening to the exterior is called the **umbilicus**.
5. The body whorl has a very large opening, the mouth or aperture. The outer margin of this opening is called the outer lip and the inner margin lying next to columella is called the **columellar lip**.
6. The shell is covered by lines of growth, which may appear ridge like and are called **varices** (singular; **varix**). The colour of shell varies from yellowish to brown to black. The shell shows a conical form with the smallest whorl on top and largest at the bottom (Fig. 9.1 a & b).

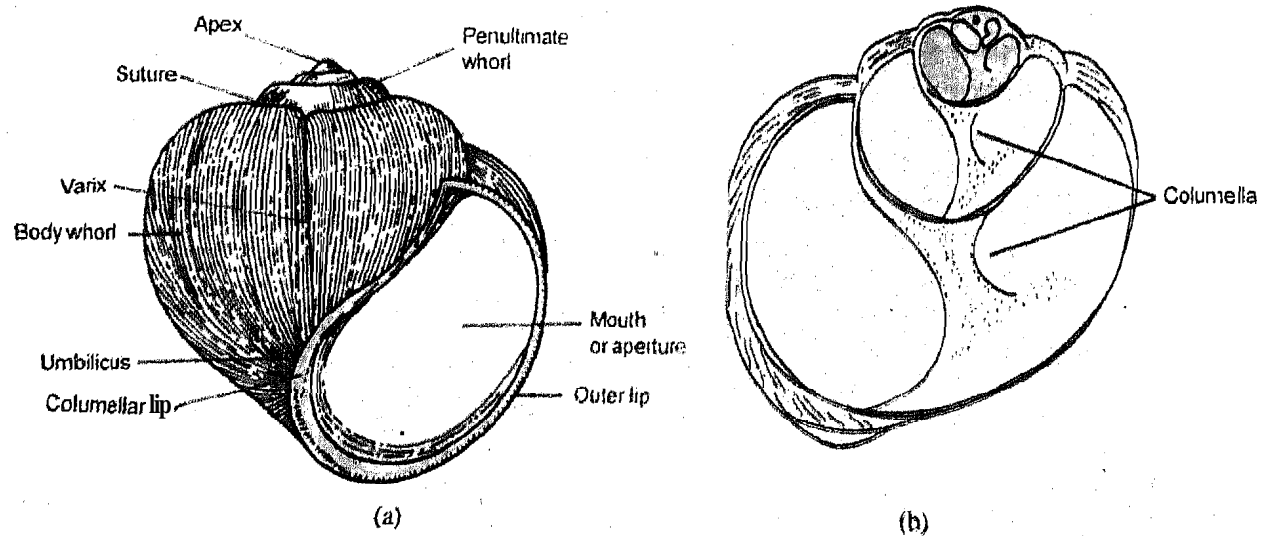


Fig. 9.1: Shell of *Pila*, (a) ventral view; (b) dorsal cut view.

9.3.2 Operculum

The mouth of *Pila* is closed by a calcareous lid, the **operculum**, which fits strongly over the mouth: The outer surface of operculum is marked by a number of growth rings and a nucleus. The inner surface of operculum has an elliptical boss where muscles are attached and it is surrounded by a groove. The operculum is secreted by the glandular cells of the foot (Fig. 9.2 a & b).

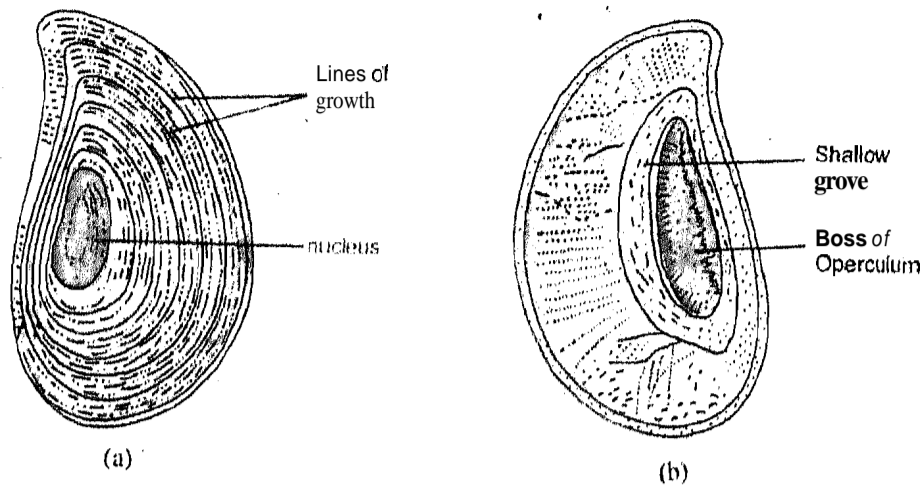


Fig. 9.2: Operculum, (a) outer view; (b) inner view.

9.4 EXTERNAL FEATURES OF *PILA* (SOFT PARTS)

To study the external features (soft parts) that is the external anatomy you have to remove the shell by following procedure so as to expose the body.

9.4.1 Procedure

1. Hold the intact animal in your left hand with its aperture/mouth facing your palm.
2. Break the top of the body whorl by repeatedly striking it with the back of the scalpel handle or some such object.
3. Using your fingers break away shell in small portions so that the underlying membrane like mantle is seen.

9.4.2 External Features

Now you will be able to see the external body parts of *Pila* as shown in Fig. 9.3 a & b.

1. The anteriormost part of the body is over the foot and is called the **head**. There are two pairs of tentacles arising from the head. The tentacles are capable of being extended. Ventrally and between the tentacles lies a slit-like mouth.
2. At the base of outer pair of tentacles lies a pair of small bead-like eyes situated on eye stalks or **ommatophores**.
3. The foot of *Pila* is a large, fleshy and muscular organ, which forms the ventral part of the body. It is triangular in shape and its pointed end is directed backwards. The ventral surface of the foot is called the sole. It is this sole which makes contact with the ground or substratum while the animal is moving.
4. The operculum is connected to the dorsal part of the foot and is posterior in position. When the foot is withdrawn the operculum covers the aperture like a tight fitting lid. The foot is the only locomotory organ of *Pila*. By the action of muscles of foot, *Pila* is able to creep over the ground. There is a mucous gland inside the foot, which leaves a trail of mucus during locomotion.
5. The rest of the body is in the shape of a mass called the visceral mass. It is a coiled structure, which extends into the penultimate whorl. It contains all the main organs of the body.

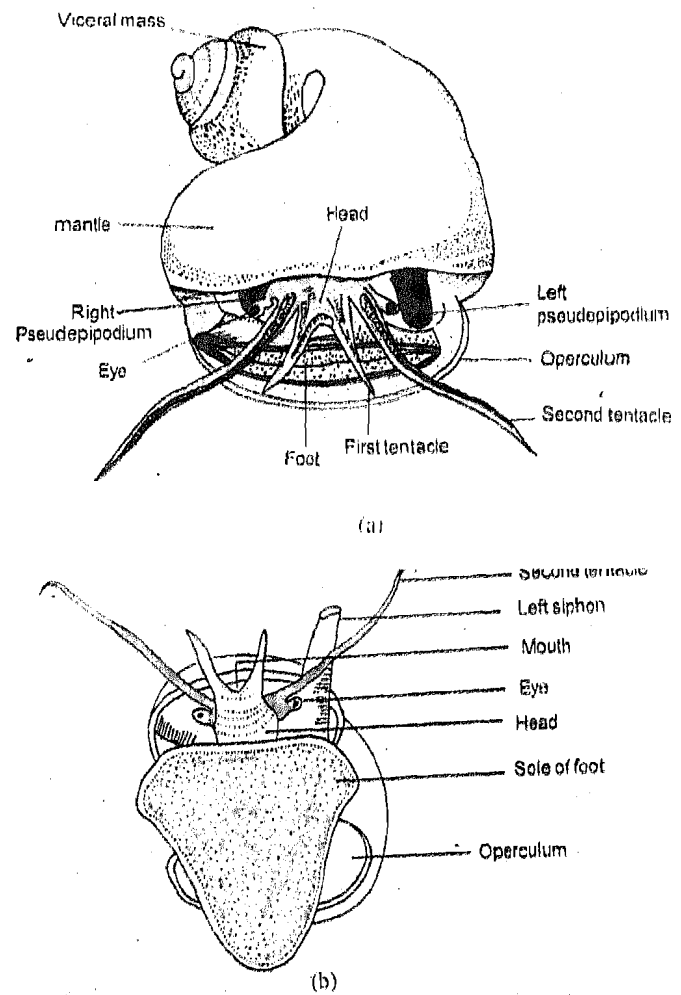


Fig. 9.3: External features of *Pila* as seen without the shell, (a) frontal view; (b) ventral view;

9.5 INTERNAL ANATOMY OF *PILA*

To study the internal parts of the *pila* follow the procedure given below.

9.5.1 Procedure

Give a longitudinal incision starting from the edge of the mantle to the posterior limit of the mantle cavity along the left edge to expose the mantle cavity. Pin down the mantle flap in the tray. You can look into the figure 9.4 for the organs of mantle cavity of the female *Pila*. [Male and female *Pila* are not sharply distinguishable externally in the intact animal. Female's shell is usually larger, the male has a well developed copulatory organ, penis, lodged in a penis sheath jointed to the mantle in the right hand side of the mantle cavity].

9.5.2 General Features

1. Mantle is the covering of the visceral mass. The edge of the mantle contains gland cells, which are responsible for secreting the shell. The mantle forms two contractile structures at the side of head, the left and right **nuchal lobes or pseudopodia** (singular; pseudopodium), that work as respiratory siphons.
2. Anteriorly, the covering of mantle over the body forms a cavity called the mantle or **pallial cavity**. The organs present within this cavity are known together as **pallial complex**,
3. A ridge is seen extending from right **nuchal lobe** to the posterior end of mantle cavity dividing the cavity into two chambers the **branchial** and **pulmonary**

- chamber.** These chambers play an important part during respiration. The respiratory organ in *Pila* is the **gill** or **ctenidium**, which is attached to the right side of branchial chamber.
- The anus is situated near the right nuchal lobe. The aperture of genital duct is also situated close to the **anus**. The male has a penis in front of the genital opening.
 - Other structures that you can see in the cavity are a large **pulmonary sac** or **lung** attached to the roof of the pulmonary chamber. A comb-like **osphradium**, which is a sensory organ is situated near the left nuchal lobe.

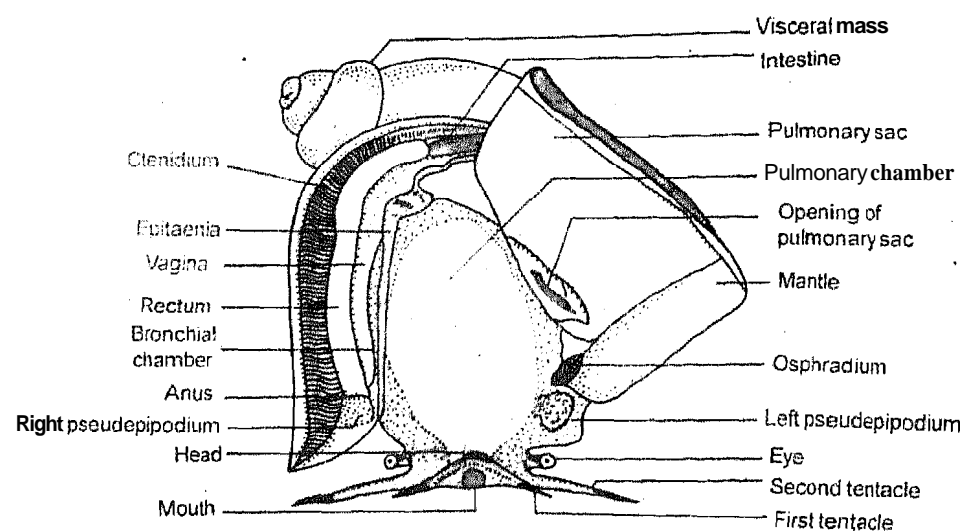


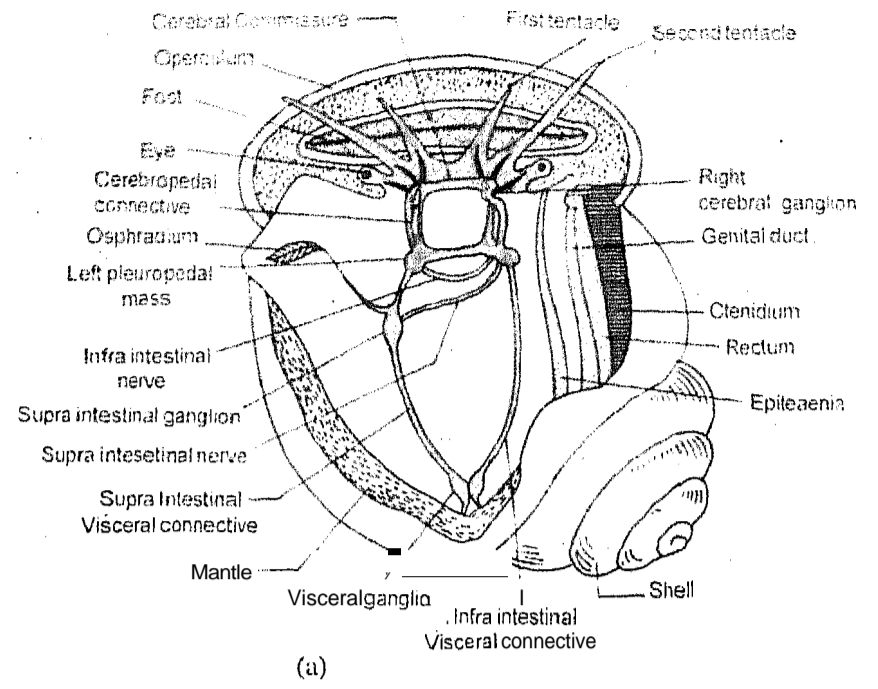
Fig. 9.4: *Pila*: organs of pallial complex (mantle cavity) in female animal.

9.6 NERVOUS SYSTEM OF PILA

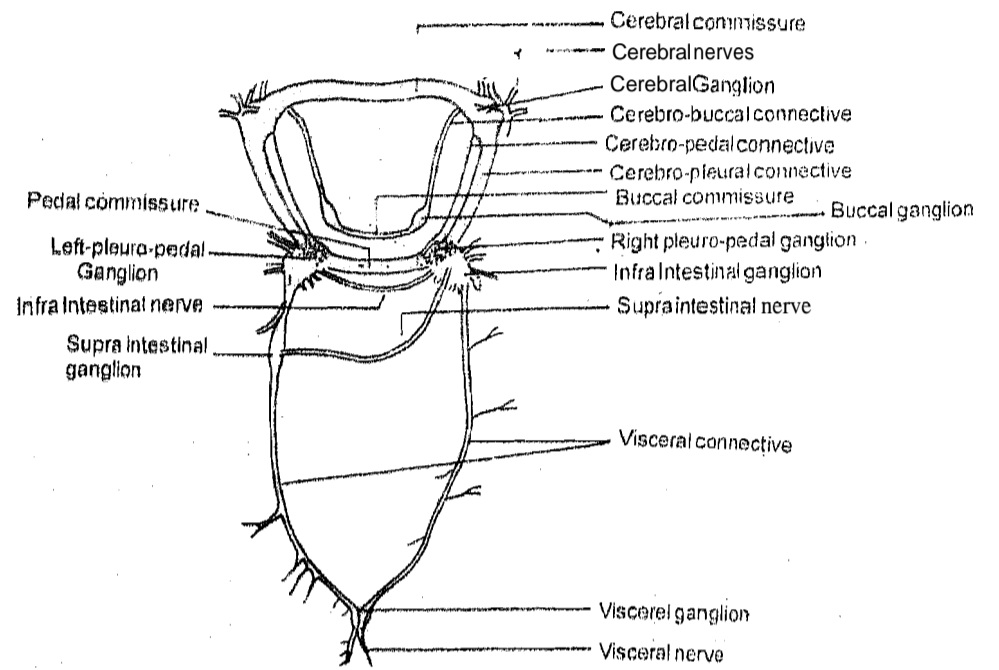
Nervous system of *Pila* is dissected by the procedure given below. Study the diagram carefully so as to recognize the parts easily.

9.6.1 Procedure and Exposition

- To expose the nervous system of *Pila*, carefully cut and remove the skin over the rounded head. A flat pale yellow or white **cerebral commissure** will be visible to you which joins the left and right **cerebral ganglia** (singular; ganglion). Incidentally the nerve connecting two similar ganglia is called a **commissure** whereas one connecting two dissimilar ganglia is called a **connective**.
- Slowly and gently expose all the nerves and ganglia as shown in the diagram 9.5. You should be very careful as the nerves are very delicate and will break very easily.
- While clearing the nerves always remove the other tissue in very small pieces. Keep your work wet by frequently dipping it in water.
- After completely exposing the nervous system you should then try to insert small pieces of black paper under the nerves so that they are visible instantly.
- Flag-label various parts of nervous system. You should insert the flag pins obliquely in the dissecting tray.



(a)



(b)

Fig. 9.5: *Pila*, (a) nervous system *in situ*; (b) nervous system.

9.7 TAKING OUT THE RADULA AND PREPARING ITS TEMPORARY MOUNT

The Radula is the organ of *Pila*, which is used to cut the food in small pieces. The radula is a flat ribbon-like structure found inside the buccal cavity of *Pila*. Radula is brownish in colour and quite hard. In this exercise follow the procedure given below to take out the radula from the *Pila*.

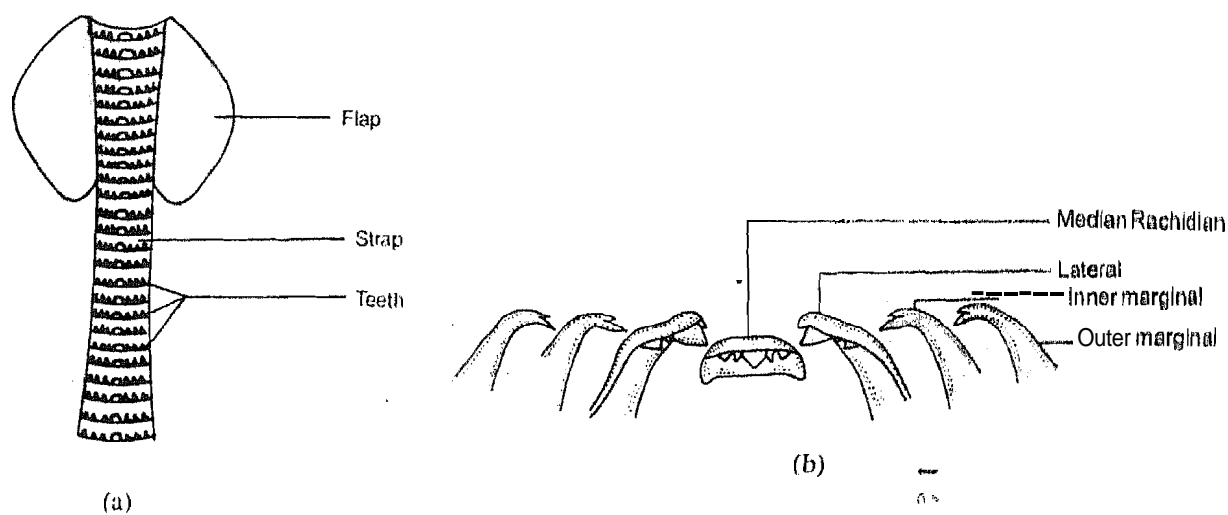


Fig. 9.6: (a) Radula of *Pila*; (b) radular teeth of *Pila*.

9.7.1 Taking out Radula

Radula is characterized by having transverse rows of minute horny teeth (Fig. 9.6a). Each row has seven curving teeth (Fig. 9.6 b). The one in the center is large and is called the **median rachidian tooth** as you can see in Fig. 9.6 b. This is followed by one **lateral** and two **marginals** on each side. The posterior end of radula lies in a **radular sac** which constantly secretes the teeth as they are being worn out on the anterior end. The cells, which secrete the teeth, are called **odontoblasts**.

Procedure

1. To take out the radula, remove the skin over the head region and you will see a rounded structure, the **buccal mass**. This is highly muscular structure, which encloses the buccal cavity.
2. If you now cut away the top layers of this buccal mass, you will see the radula in the buccal cavity.
3. Pick up the radula with a forceps and then cut it at its points of attachment.
4. Place it in a watch glass and cover it with water.

9.7.2 Mounting of Radula (Temporary mount)

Now, after taking out the radula you have to prepare a temporary mount of it for further examination. To do this,

1. Cut the radula in a piece of about 5 mm square.
2. Put it over a clean glass slide with its tooth-bearing side facing upward.
3. Put a few drops of glycerin over it and gently lower a cover slip on it. You must take care to put only that much glycerin which should flow neither out of the coverslip nor should it be less to leave air spaces under it.
4. Now observe the fine details of teeth under a dissecting microscope as shown in Fig. 9.6 b.

Precautions

For carrying out the dissection a few points must always be kept in mind:

- Before cutting or separating any part, identify all the visible structures without dissecting them.
- Find out what structures will be visible after dissection and what may be damaged if dissection is not done carefully.
- Do not cut anything unless you know what it is and why it should be cut.
- Unless instructed, do not remove a part completely.

- For making **an** incision, insert one point of scissors so that it does not go in deeply **then** cut in **short** lifting strokes holding **the** lower blade **almost** parallel to **the** layer **that** is being cut.
- Use closed **points** of forceps, probe, needle or fingers for separating, loosening **and** lifting of parts to expose underlying structure.
- Carry out all operations in a dissecting tray filled with water. **Change** the water frequently.

9.8 TERMINAL QUESTIONS

1. Explain the following terms in short.

i) Unilocular shell

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ii) Operculum

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2. i) List the steps involved in exposing the external anatomy of *Pila*.

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ii) Differentiate between:

(a) Pallial cavity and pallial complex

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(b) Ctenidium and Osphradium

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3. i) How many ganglia are found in the nervous system of *Pila*? Name them.

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ii) What is a commissure? Name two commissures you have observed in the dissection.

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4. i) Where is radula situated in the body of *Pila*?

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ii) How **many** teeth are **present** in each row of radula? Name these.

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