

MOLLUSCA

- * Mollusca are multicellular organism.
- * They have bilateral symmetry. It is triploblastic animals.
- * They are coelomate animals. They have organ system grade of organization.
- * The body is soft and unsegmented.
- * The soft body is covered by a fleshy fold of the body wall. It is called mantle.
- * The shells may be external or internal.
- * Respiration carried out by gills or pulmonary chambers. The digestive system is well developed.
- * circulatory system is open type.
- * The sensory organs are eyes, statocysts and osphradia.
- * Sexes are separate.

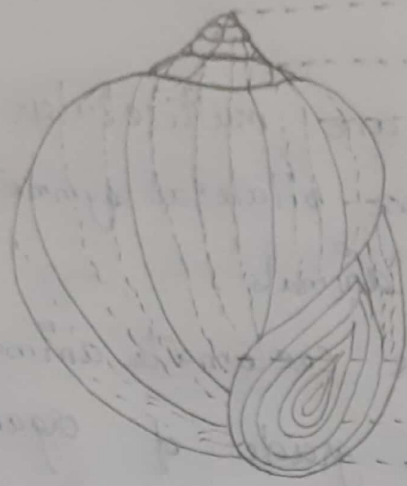
PILA (Apple snail)

Phylum: Mollusca

Class: Gastropoda

Order: Pectinibranchia

- * Pila is commonly called Apple snail.
- * It has a soft, unsegmented body covered by a mantle and a shell.



PILA SHELL

* It appears to walk on foot. It is a freshwater animal.

* It lives in ponds, lakes, rivers, etc. and also live on land. So, it is an amphibious animal. It is herbivorous in habit.

Shell:

* The soft body of the pila is covered by a shell. It is spirally coiled. The coils are called whorls.

* The upper whorl is smaller and is called apex. The lower most whorl is larger and it is called larger whorl.

* The line of contact b/w the whorl is called suture. It has lines of growth.

* The mouth of the shell is closed by a lid called operculum.

* It is made of calcium carbonate and conchiolin.

Body Organization:

* It is three parts is present.

They are :

1. Head
2. foot
3. visceral mass.

Head: * Head has two pair of tentacles and pair of eyes.

visceral: * visceral mass form main part of the body spirally called shell. It covered fold of skin called mantle or pallium.

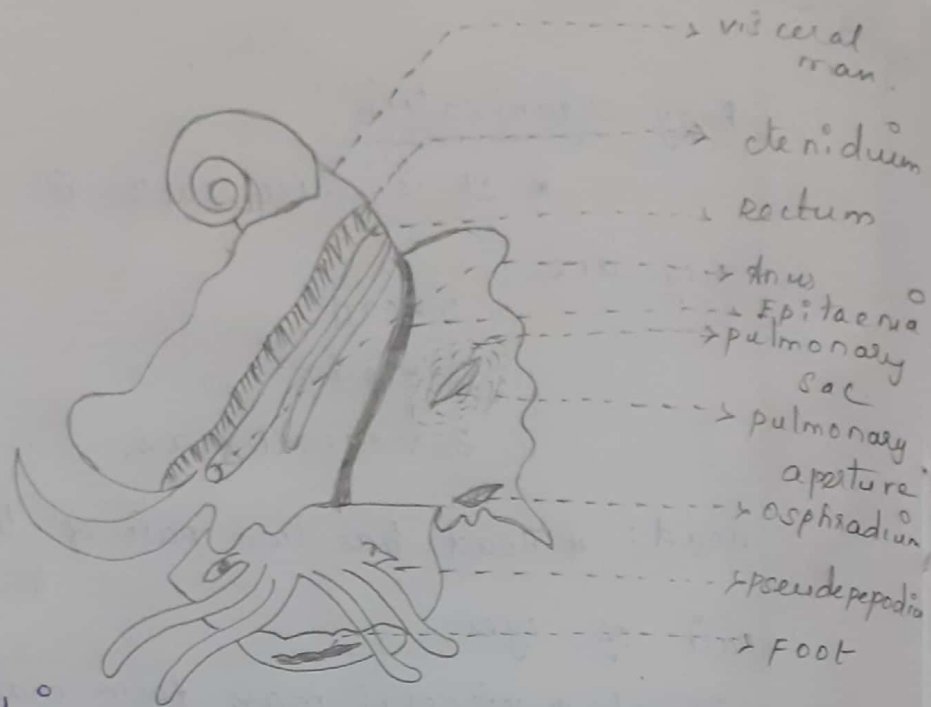
foot: * foot found namely: anterior propodium and posterior metapodium.

Pallial complex:

* cavity lying below the body and ^{Shell} mantle, is called mantle cavity. It contains number of organs collectively called mantle complex or pallial complex.

Following organ is pallial complex.

1. ctenidium 6. pulmonary sac
2. Rectum 7. osphradium
3. Genital duct 8. pseudopodium
4. Epitaenia
5. kidney



ctenidium :

* It is a gill used for aquatic respiration.
 Arranged on right side of mantle cavity.

Rectum :

* It is a posterior region of digestive track.

Genital duct:

* It is oviduct in female & vas deferens in male.

Epitaenia :

* It is a thick muscular ridge.

kidney :

* It opens into a mantle cavity by renal aperture.

pulmonary sac :

* It opens into a mantle cavity by

pulmonary aperture.

osphradium:

* It is comb shaped organ attached to the mantle. It is olfactory in function.

pseudopodia:

* Folding of margin of the mantle on either side of head. They are also called, nuchal lobes. It is used for respiration.

Digestive System:

* It formed of alimentary canal and digestive gland. Alimentary canal is well developed. It consists of.

* Mouth

* Buccal mass

* Oesophagus

* Stomach

* Intestine

* Rectum

* Anus.

Buccal mass → It is present in radula.

It is present 7 type of teeth. They are:

* Rachidian teeth - 1

* Lateral teeth - 2

* Marginal teeth - 4.

* Teeth is secreted by odontoblasts.

Digestive gland is two types.

- * Salivary glands
- * Hepatopancreas.

1. Salivary glands:

* A pair of salivary glands is present. Salivary secretion contains mucus and enzymes.

2. Hepatopancreas:

* It is a brownish colour. It formed 3 type of cells:

1. secretory cell
2. Resorptive cell
3. lime containing cells.

Feeding & digestion:

* It is a Herbivore. Starch is absorbed by resorptive cells. It diffuse the blood. The undigested food pass to anus.

Respiration:

* It is a Amphibious animal, two modes of respiration is present.

1. Aquatic respiration
2. pulmonary respiration

1. Aquatic respiration:

* The Respiratory organ for aquatic is gills or ctenidium. Single gill is present. It has an axis. The axis attached to the mantle arranged triangular plates called lamellae. This type of gills is monopectinate.

MECHANISM:

* The exchange of gases take place b/w the blood of ctenidium and water.

2. pulmonary Respiration:

* This type of respiration present in land. The respiratory organs of lungs or pulmonary sac.

MECHANISM:

* The pulmonary sac rhythmic movement of contraction and relaxation. The blood of pulmonary sac takes O_2 from the air and give out CO_2 .

circulatory system

* It is a open type. It consists of blood, pericardium, Heart, Arteries, Sinuses and vein.

1. Blood :

* It is blue in colour. It contains the plasma and corpuscles. A blue pigment is present [Haemocyanin].

2. Pericardium :

* Heart lies in the pericardial cavity. The pericardial cavity represents the true coelom.

3. Heart :

* It is formed of two chambers, namely Auricle and ventricle. Auricle is posterior in position. It opens to a ventricle through auriculo ventricular aperture. A pair of semilunar valves is present. They allow the flow of blood from auricle to ventricle.

4. Arteries :

* Large vessel called aortic trunk arises from ventricle. It is divided into two branches :

1. Anterior cephalic aorta
2. Posterior visceral aorta.

1. Anterior cephalic aorta :

* It supplies the blood of mantle
→ pseudopodium → oesophagus → skin → head

and foot.

4. posterior visceral aorta,

* It supply the blood to stomach
→ Intestine → Liver.

5. Sinuses:

* The impure blood from various parts of body collected into a small space that is called lacunae. The spaces join together to form a large space, that is called Sinuses. Four main sinuses is present:

1. perivisceral sinuses
2. perintestinal sinuses
3. Branchio renal sinuses
4. Pulmonary sinuses.

6. Veins:

* It transports the blood from various parts of body. There are five veins is present.

1. Afferent ctenoidal vein
2. Efferent ctenoidal vein
3. Afferent renal vein
4. Efferent renal vein
5. pulmonary vein.

Mechanism of circulation:

* Blood from heart supply to all

organ of body through branches of cephalic and visceral axons. Blood is collected in perivisceral and perintestinal sinuses.

2/20.

Excretory System:

* It is termed single renal organ, or kidney. Kidney consists of anterior chamber and posterior chamber. The anterior chamber opens into a mantle cavity by the renal aperture. The posterior chamber is broad it opens to a other end. The nitrogenous waste materials are separated. The waste materials from the posterior chamber at passes into a anterior chamber. When the animal inside the water, it excrete the ammonia, and when it is on land excrete the uric acid.

Nervous system:

* Well developed nervous system is present. Most of the ganglia are placed

in the form of ring around the buccal mass, the nervous system is formed

* Ganglia

* commissures

* connectives

* nerves.

Nerve
↓
Group of nerves -
Ganglia

commissures
(connects two ganglia)
↓
connectives
(connects two nerves)
(the smaller)

Ganglia:

1. cerebral ganglia

2. pleural "

3. pedal "

4. supraintestinal "

5. visceral "

6. buccal "

Commissures:

* The nerves connecting similar ganglia are called commissures. It is three types:

1. cerebral commissures

2. pedal commissures

3. buccal commissures.

1. It connecting to the two cerebral ganglia.

2. It connecting to the two pedal ganglia.

3. It connecting to the two buccal ganglia.

Connectives:

* Nerves connecting two dissimilar ganglia are called connectives.

1. cerebropleural connectives.
2. cerebral pedal connectives
3. cerebral buccal connectives.
4. Left visceral connectives.
5. Right visceral connectives.

1. It connects cerebral and pleural ganglia.

2. It connects cerebral and pedal ganglia.

3. It connects cerebral and buccal ganglia.

4. It connects supraintestinal with visceral ganglia.

5. It connects visceral ganglia with right pleural ganglia.

Nerves:

* Infra Intestinal nerve

* Supra Intestinal nerve

* Oesophageal nerve

Sensory Organs:

- * eyes
- * statocyst
- * osphradium
- * Tentacles.

1. Eyes:

* Two eyes is present. They are stalked & the eye is called ommatophore. Retinal cells is present. The transparent membrane of inner cornea and outer cornea is present. The optic vesicle is present. The vesicle filled with gelatinous substance called lens.

2. Osphradium:

* It is leaf-like structure. It has a central axis with two rows of leaf like structure is called lamellae. It is a chemoreceptor in function.

3. Statocyst:

* Pila has two statocyst. It filled with fluid minute calcareous particle float this fluid, they are called statoconia.

4. Tentacles:

* Two pair of tentacles is present in head. They are tactile in function.

Reproductive System male:

- * Testis
- * vas efferentia
- * vas deferens
- * Seminal vesicle
- * copulatory organ
- * Hypobranchial gland.

Female reproductive system:

- * ovary
- * oviduct
- * Seminal receptacle
- * uterus
- * vagina

Fertilization:

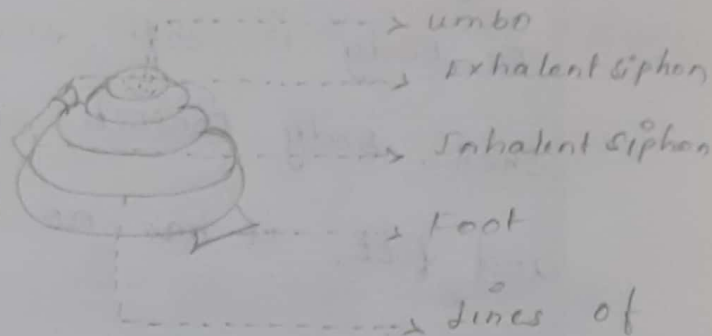
* Sperms are introduced into Seminal receptacles of female. The fertilization is internal. Two hundred eggs are produced at the time. The young ones resemble the adult form.

Lamellidens (or) Freshwater mussel.

* Phylum : Mollusca

* Class : Peleypoda

* Order : Lamellibranchiata



* Lamellidens is commonly known as freshwater mussel. It is bilaterally symmetrical, soft body covered by a shell. It is a freshwater animal. It is found in ponds, lakes, rivers, etc. It is omnivorous. Filter feeding method. elongated, oval shape. Anterior, posterior, lateral, ventral and dorsal sides are present. Shell is formed of two pieces called valves. It is long and oval shape. The white elevation is called umbo. The inner shell has many impressions that is called pallial line. The shell is composed of calcium carbonate and a horny substance called conchiolin. Three layers are formed. That is,

1. Periostracum - It is a outermost layer.
2. Prismatic layer - It is a middle layer.
3. Nacreous layer - It is a innermost

layer.

The body is soft, enclosed by hard shell. Body consists of mantle, viscera and foot. It has no head. Two tubes is present.

* Inhalent Siphon

* Exhalent Siphon.

Water enters the body through inhalent siphon and comes out through exhalent siphon.

Musculature:

* Two shell valves are operated by two large muscle, that is called anterior and posterior adductor muscles.

Respiration:

* Aquatic in habit. Aquatic respiration or Gill respiration are two

types: 1. Mantle respiration

2. Gill respiration.

1. Mantle :

* It is a fold of skin covering the soft body below shell. It is richly supplied with blood and continuously bathed with water. Exchange of gases occurs b/w blood and water.

2. Gill :

* It is carried out by gills or ctenidia. Two gills are present. The gills of bivalve plate-like, they are called lamellibranch. It is W-shaped. Outer lamellae and inner lamellae is present. Each lamellae is formed of vertical filament that is called gill filament. The lamellae are perforated by minute opening called ostia.

cilia :

* Each gill filament is covered by a layer of ciliated epithelial cells. The cilia are longer. This longer cilia are referred to latero frontal and lateral cilia.

Blood supply :

* Gills receive the venous blood from

the kidney through afferent branchial vessel. oxygenated blood carried to through efferent branchial vessels.

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Digestive system:

* It consists of alimentary canal and digestive gland.

1. Mouth
2. oesophagus
3. Stomach
4. intestine
5. Rectum
6. Anus.

Mouth:

* External and internal labial palp is present.

Oesophagus:

* It is a short tube.

Crystalline style:

* Stomach is produced into a out growth is called crystalline sac. Amylase enzyme dissolved the material.

Intestine:

* It contains pair of fold inside

called Typhlocoelae.

Digestive gland:

* It formed a pair of liver located around the stomach. Liver following function:

1. It secrete the digestive enzyme.
2. It ingest and break solid food particles.
3. It digest fat and proteins.
4. It absorb carbohydrate.

Digestion:

* It is a intracellular digestion. entire alimentary canal contain amoeboid cells. It digest the food particles, this is called intracellular digestion.

* The undigested food particles are passed out through intestine, Rectum and anus.

Circulatory system:

* It is a open type.

1. Blood
2. Heart
3. Sinuses
4. Arteries
5. Veins.

Blood :

* Blood is form plasma and Corpuscles. Blood is blue in colour. present in blue pigment & Haemoglobin.

Heart :

* It is covered by a membrane of pericardium. Heart is form three chambers. Two auricle and one ventricle. The auricle opens into a ventricle, & auriculo ventricular wall is present.

Arteries :

* two blood vessels anterior aorta and posterior aorta is present. The mantle receives two pallial arteries.

They are :

1. anterior pallial artery
2. posterior pallial artery.

Sinuses :

* The artery opens into a small blood spaces called sinuses.

Veins :

* The blood from sinuses is collected into large veins is called Venacava.

* Affluent renal vein
* Effluent renal vein is present.
* Affluent ctenidial veins
* Effluent ctenidial vein is present.

Excretory system:

* It following the organs. they are:

1. organ of Bojanus or kidney
2. Keber's organ.

1. Organ of Bojanus:

* Freshwater mussel has two kidney. It first observed Bojanus. Hence the name organ of Bojanus.

They situated beneath the pericardium. one limb of kidney is ventral in position. other limb is dorsal in position. The urinary bladder two sides communicate with each through an oral aperture.

2. Keber's organ:

* It is large reddish brown colour. situated in front of pericardium.

Mechanism:

* kiber's organ discharge the nitrogenous waste material.

waste → kidney → RENO PERICARDIAL aperture

↓
Stygnobranchial Chamber. urinary bladder

kidney proper also filters nitrogenous waste product from blood.

Nervous system:

* It consists of three pairs of ganglia, connectives and small nerves.

1. Cerebro pleural ganglia

2. pedal ganglia

3. visceral ganglia.

1. cerebro pleural ganglia:

* This ganglia present in above mouth and mantle. Two ganglia on both sides are connected by cerebral commissures.

2. pedal ganglia:

* A pair of pedal ganglia is

present. They are connected with cerebral ganglia by a pair of cerebro-pedal connectives.

3. visceral ganglia.

* A pair of visceral ganglia is present. They are connected to cerebral ganglia by a pair of cerebro-visceral connectives.

Sensory Organ:

- * Statocysts
- * ophratria
- * sensory cells.

1. statocysts:

* A pair of statocysts is present. It forms two layers namely outer connective tissues and inner sensory epithelium. It is filled with the fluid called calcareous particles called statolith. Function as equilibrium.

2. ophratria:

* A pair of ophratria is present. The function of chemoreceptors.

Sensory cells:

* Sensory cells are scattered epithelial cells located on the edge of mantle in inhalant siphon.

Function as tactile and photoreceptors.

Reproductive System:

* Sexes are separate. Male and female.

Male reproductive system:

* In male is a pair of large, much branched testis, coiled in intestine. Each testes arises from vas deferens which open to a mantle cavity through male genital aperture.

Female reproductive system:

* In female, a pair of large branched, reddish ovaries, coiled in intestine. Each ovary arises from oviduct. It opens to a female genital aperture.

Fertilization and Development:

Glochidium larva: $\approx 4\text{mm}$.

* It is larva of freshwater mussel. It is minute, microscopic. It covered by a shell. Sensory cells is produced. fully matured larva pass out going to water to attach to fish.

Encystment:

* It attached to the fish. The larva obtain the nutrient from the fish. Larva leads to ectoparasitic life. The life go for ten weeks.

Metamorphosis:

* The sensory cells is developed. gut, mouth & anus is developed. Foot & gills is appear. After the metamorphosis to release tiny young one comes out rupture of cyst.

Advantages of Parasitic life:

* Larva protected from predators. Larva get nourishment. Transport different places.

7.02.2020.

Mollusca

Economic importance of mollusc:

* Beneficial

* Destructive

Beneficial mollusc:

1. Food
2. Bait
3. Pearls & oyster
4. Ornamentation
5. Dyes & Ink.
6. Medicine.

Destructive mollusc:

1. Herbivore $\rightarrow$ vegetative plants &

decorative crops.

2. Carnivore $\rightarrow$ feed organism.

3. Destructive polychaetes $\rightarrow$ Terebrantula (Ship worm).

4. Parasites

5. Intermediate host

Torsion in Mollusca:

* Torsion is defined as a rotation of visceral organs to an angle of 180° in anti-clockwise direction.

* It occurs in larva of gastropods.
for example: Pila.

process of torsion:

* The alimentary canal is straight with mouth.

* The mantle cavity ctenidia located posteriorly.

* The nervous system is bilaterally symmetrical.

Torsion occurs following ways;

* ventral flexure - The shell and visceral mass become cone shaped.
first and finally become spirally coiled.

* Differential growth

* Anti-clockwise direction - The pallial complex rotate 180° ; the organ left to right.

Event in torsion:

- * looping of alimentary canal,
- * twisting of nervous system
- * Displacement of mantle cavity.
- * change in the position of ctenidia.
- * Displacement of auricle.
- * coiling of shell and visceral mass.
- * Loss of symmetry.
- ~~* Detorsion.~~

Detorsion:

- * Some of the gastropods
- * Reversion of torsion is called detorsion.

Advantages:

- * Respiration
- * Locomotion
- * Sensation
- * protection.

Dis Advantages:

- * Sanitation
- * Respiration.

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Pearl oyster culture: Types:

1. Lingha pearl
2. Seed pearl
3. Baroque pearl
4. Blister pearl
5. Oriental Pearl
6. Natural pearl
7. Cultural pearl.

* Pearl is a concretion formed by mollusc.
It consists of Nacre.

* It formed two substance calcium carbonate, Albumoid substance.

* pearls produced by bivalve. It is a marine and freshwater animal.

* pearls are sedentary animal attached to rocks, Grow in max size in 4 or 5 years.

Pearl formation:

* When foreign material such as sand grain or parasitic happens enter to the body, it occurs the mantle.

* This mantle epithelium start and secrete the concentric layers of Nacre around the foreign material, complete the

Structure is called pearl.

culture of pearl:

1. collection of oysters
2. preparation of graft tissue
3. preparation of nucleus
4. Implantation
5. Rearing of oysters
6. Harvesting.

1, Pearl oyster collected bottom the sea. The young oyster is collected. The young oyster is also called spats.

2, A piece of tissue inserted into oyster is called graft tissue. The graft must be square 2×2 mm in size.

3, The nucleus is a foreign material inserted into a oyster of 2 mm in diameter. It is prepared from the shell of mollusc.

4, The nucleus placed on the graft tissue, then the oyster is released in cages. The entire operation completed in 30 mins.

5, The cages are suspended from rafts in the sea. This type of culture is called raft culture.