

E-content for

B.sc. Part-I Zoology Honours

Paper I: Group B- Coelomate Non-chordata

Topic: Moulting in Insects

By:

Ms. Sujata Kumari


Assistant Professor, Magadh Mahila College,

Department of Zoology, PU

Email: singhsujata52@gmail.com

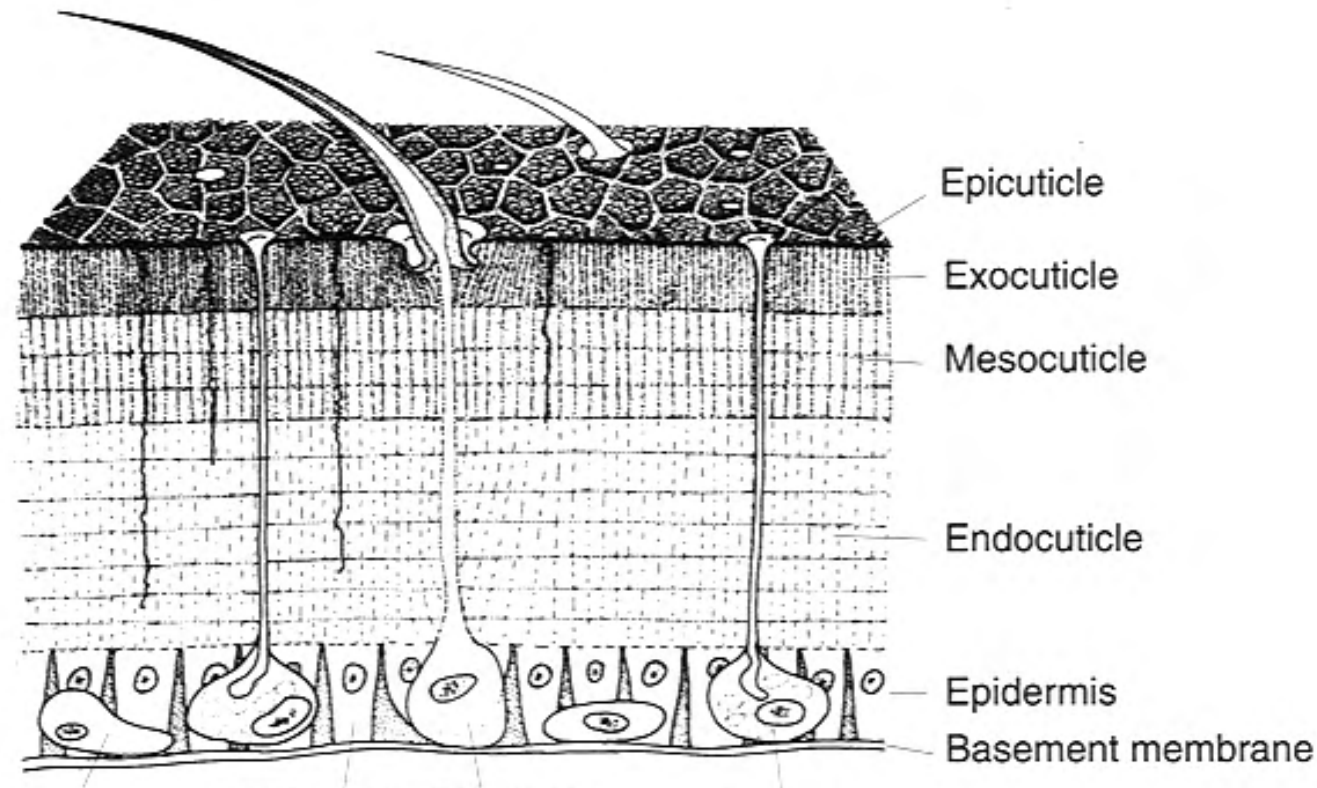


Insect Growth and Development

- The growth and development of insects are largely a function of the growth and development of their integuments.
 - **Moulting**
 - **Metamorphosis**
- 

Structure of the Integument

- ▶ The outer covering of insects is referred to both as an exoskeleton and an integument.
- ▶ The integument consists of
 - ▶ basement membrane
 - ▶ epidermal cell layer – epidermis
 - ▶ nonliving cuticle





NEED OF MOULTING

Growth is limited by the cuticle which only undergoes a limited amount of stretching so that for any marked increase in size to occur the cuticle must be shed and replaced

Definition:

Periodical shedding or casting of old cuticle and developing and hardening of new cuticle

Two main process in moulting

It mainly involve two distinct process which may be widely separated in time so that it is convenient to distinguish between them. The two main process are

1. Apolysis - separation of old cuticle
2. Ecdysis - shedding of remnants of the old cuticle

STEPS INVOLVED IN MOULTING PROCESS

- 1. Apolysis**
- 2. Secretion of inactive moulting fluid by epidermis**
- 3. Production of cuticulin layer of new exoskeleton**
- 4. Activation of moulting fluid**
- 5. Digestion and absorption of old endocuticle**
- 6. Epidermis secretes inner epicuticle and new procuticle**
- 7. Ecdysis**
- 8. Expansion of new integument**
- 9. Tanning**

Changes in epidermis

- The onset of moulting is indicated first by changes in the epidermal cells which divide mitotically and become columnar in form; they are flattened the over all area of the epidermis, hence the cuticle size is increased
- Separation of old cuticle from the epidermis - As a result of changes in cell shape, a tension is generated at the surface of the epidermal cell which result in their separating from the cuticle
- Digestion of old endocuticle - As the cuticle separate from the epidermis moulting fluid is secreted into the space. As a result of activity of moulting fluid line of weakness appears in the ecdysial line. The moulting fluid contain the enzyme proteinase and chitinase



ECDYSIS

- Usually ecdysis follows as soon as digestion is complete
- As a process of separating the old cuticle which consist of epicuticle and exocuticle from the new cuticle
- In sometime the old cuticle may retain for a time and the insect referred to as pharate instar


DURING ECDYSIS

- The pore canal within the procuticle allow the movement of lipids and proteins towards the new epicuticle where the wax layer and cement layer form
- Forms shortly before ecdysis wax is separated on to the surface of the new cuticle and the layer adjacent to the cuticulin forms oriented monolayer
- Soon after ecdysis the layer formed is the cement layer



TANNING

- The wrinkled new integument is expanded by stretching
- Differentiation of procuticle into exocuticle and epicuticle take place(after ecdysis) by sclerotization of exocuticle alone
- After hardening muscle relax ,and air is exhaled ,blood pressure reduce and the space is now available for further protoplasmic synthesis
- Until the process of tanning is complete it is called as in teneral condition



Terms used in insect during moulting stages

- Instar - Insect growth occurs through a series of immature stage is called instar
 - Stadium - Time interval between two subsequent moulting
- 