QUADRANT II – TRANSCRIPT AND RELATED MATERIALS (NOTES)

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Subject: ZOOLOGY

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Paper Title: Diversity of Non-Chordates and Cell Biology

Unit 07: Phylum Arthropoda

Module Name: Metamorphosis in insects

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Notes

Insects go through a rapid and complete transformation from an immature larval life to an adult form. This process involves morphology, function as well as habitat changes. The periodic shedding of the old exoskeleton is termed ecdysis or moulting. The duration of the period between two successive moults of a developing insect is called stadium. Also, the form of the developing insect between two moults is called an instar.

AMETABOLOUS METAMORPHOSIS: In this type of metamorphosis, the insects undergo little or no metamorphosis. The young ones emerge from the egg and resemble adults. The young ones resemble the adult form and are termed nymphs. The nymph grows in size and undergoes moulting. The insects are mainly wingless. E.g. Silverfish, Springtails.

GRADUAL METAMORPHOSIS: In winged insects, the nymph hatches from the egg has a resemblance to the adult form. The young ones are termed nymphs. Features such as wings or reproductive organs are undeveloped in the nymphs. They undergo slow but steady change by the moulting process. The insects undergo three stages: Egg→ Nymph → Adult. E.g. Cockroach, Grasshopper, Praying mantis.

INCOMPLETE METAMORPHOSIS: In this type of metamorphosis, the insects undergo three stages: Egg→ Naiad → Adult. The eggs are covered by an egg case. The eggs then hatch into younger nymphs. The juvenile forms are termed naiads. The nymph resembles the adult without wings. The Naiads are aquatic and respire using external gills. They show the presence of 3 pairs of thoracic legs, head with compound eyes, antennae and small abdomen with posterior tracheal gills. The nymphs develop into the adult stage through a series of molts. The adults are terrestrial. E.g. Dragonflies, Damselflies.

COMPLETE METAMORPHOSIS: In this type of metamorphosis, the insects undergo four stages: Egg→ Larva → Pupa →Adult. The morphological changes are rapid wherein the larva has no similarity with the adult. The pupal stage is always present. The larvae of butterflies are called a caterpillar. The larva is inactive and does not feed when they are inside the cocoons. It develops more segments, internal organs, legs, and wings. The larval form transforms into a pupa which can last from 4 days to several months. E.g. Beetles, Butterflies, Mosquitoes, Flies, Bees.

TYPES OF PUPA: There are mainly three types of pupa seen in holometabolous metamorphosis.

1. **Exarate pupa-** Presence of legs, wing-cases lying free along the body length. E.g. Hymenoptera.
2. **Obtect pupa**- Presence of legs, wing-cases firmly attached along the body length. E.g. Lepidoptera.
3. **Coarctate pupa-** Larval skin forms covering the pupa. E.g. Diptera.

TYPES OF LARVA: Similarly, there are mainly three types of larva seen in holometabolous metamorphosis.

1. **Compodeform larva-** Thick integument, 03 pairs of thoracic appendages, no abdominal appendages. E.g. Coleoptera.
2. **Eruciform larva(Caterpillars)-** Thin integument, distinct head, small antennae, 03 pairs of thoracic legs, 4-5 pairs of abdominal legs. E.g. Lepidoptera.
3. **Apodous larva-** Thoracic and abdomen region devoid of appendages. They have termed maggots in diptera and grubs in Hymenoptera.

HYPERMETAMORPHOSIS: There are more than five larval instars in hypermetamorphosis. They have two or three distinct types of larval instars. E.g. Blister beetles.

HORMONAL CONTROL OF METAMORPHOSIS: Moulting in insects is controlled by hormones of endocrine glands. The prothoracic glands are a pair of small glands in the first thoracic segment that produces a hormone called ecdysone. This hormone helps in the moulting and development of reproductive organs.

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