MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END EXAMINATION
B.Sc.(Hons.) Horticulture

Semester	: II (New)	Academic year	: 2017-18
Course No	: H ENTO-121	Title	: Fundamentals of Entomology
Credits	: 3 (2+1)		
Day and Date	:	Time: 3 hrs	Total Marks: 80

Note:
1. Solve ANY EIGHT questions from SECTION "A".
2. All questions from SECTION "B" are compulsory.
3. All questions carry equal marks.
4. Draw neat diagrams wherever necessary.

MODEL ANSWER PAPER
SECTION "A"

Q. 1 Define insect. Explain the characters responsible for dominance of class Insecta.

Ans: Define insect: **2 marks**

Insects are tracheate Arthropods in which body is divided into head,thorax and abdomen, head bears a pair of antennae, thorax bears three pairs of legs and generally two pairs of wings in adults and abdomen is devoid of ambulatory appendages and under goes metamorphosis.

Characters: **6 marks**

1. **Exoskeleton** :- They have hard, chitinous exoskeleton. It provides area for Muscle attachment Protect internal organs. Prevents desiccation. Exoskeleton maintains the shape of the body.
2. **Small size** :- They have habit to develop large number of smaller individuals than smaller number of larger individuals. This increases the chances of survival of the species. Survive on small quantity of food.
3. **Quicker speciation** :- Due to mechanical rigidity of the exoskeleton, even minute Variations in the external genitalia lead to reproductive isolation and consequent fixation of the species.
4. **Hexapod locomotion** :- The number of legs of insect has reached an ideal stage of evolution.During locomotion, insect body rests on a tripod, while other three legs move forward. Tripod mode provides stability to locomotion.
5. **Functional wings** :- It increases the chances of survival. It increases feeding range, breeding range.
6. **Differentiation of body** :- Head, Thorax and Abdomen which is favourable arrangement for insects.
7. **Tracheal respiration** :- system supplies oxygen directly to each and every cell of the body.
8. **Developmental characteristic** :- reduces the competition of food and shelter requirement.
9. **Decentralized nervous** 10) **Chemical communication.**

Q. 2 Describe central nervous system in insect with neat labeled diagram.

Ans :Diagram: **2 marks**

Description: **6 marks**

The central nervous system of cockroach is divisible into three parts.

1) **Brain or Supra oesophageal ganglion:** The brain consists of three pairs of

ganglion.

a) **Protocerebrum** : It is a fused pair of ganglia of the pre-antennary segment and supplied nerves to the compound eyes and ocelli.

b) **Deutocerebrum** : It is formed by the fusion of the ganglia of antennary segment and gives off nerves to the antennae.

c) **Tritocerebrum** : It is formed by the fusion of the ganglia of the third head segment and gives off paraoesophageal or circumoooesophagal connectives and also supplies nerves to the brain.

2) **Sub-oesophagal ganglion** : It is formed by the fusion of ganglia of mandibular, maxillary and labial segments and gives of paird nerves to the respective appendages of head.

3) **Ventral nerve cord** : It consists of a series of ganglia lying on the floor of the body cavity, united by a pair of connectives and commussures. In case of cockroach, there are nine pairs of ganglia. The Ist three are thoracic ganglia and situated in each thoracic segment. The pairs of ganglia are present in abdominal region. Five pairs of abdominal ganglia are present in Ist five abdominal region, while the last one is a ganglionic centre formed by the fusion of terminal ganglia of the abdomen.

Q. 3 Enlist different types of mouthparts in insects with examples and describe mouthparts of cockroach.

Ans : Types of mouthparts in insect: **2 marks**

A) Mandibulate type : a) Chewing and biting type e.g. Grasshopper.

B) Haustellate type : a) Piercing and sucking type e.g. Red cotton bug.
b) Rasping and sucking type e.g. Thrips.
c) Chewing and lapping type e.g. Honey bee.
d) Siphoning type e.g. Butterfly and Moth.
e) Sponging type e.g. House fly.

Description: **6 marks**

The chewing and biting type of mouthparts consists of :

1) Labrum or Upper lip : It is a single or unpaired sclerite, hinged to the clypeus, forms roof of the preoral cavity. There is a notch like structure, useful for holding the food material. The inner surface lined by a small lobe like structure called epipharynx which is a food taster or gustatory organ.

2) A pair of mandibles (First pair of jaw): are two in number, highly chitinized structures, used for chewing or grinding or cutting the food material, The movement of the mandibles is effected by the outer abductor and inner adductor muscles.

3) A pair of maxillae: Maxillae are also two in number and form the second pair of jaw. Each maxilla consists of a cordo, stipes, maxillary palpus, lacinia and galea.The function of maxillae is to hold the food material while it is being chewed.

4) Hypopharynx : This is a tongue like prolongation of the floor of mouth cavity. The function of hypopharynx is to mix the saliva with the food material received from the salivary glands.

5) A Labium (Lowerlip) :It forms the floor of the mouth cavity and consists of three parts i.e.prementum, mentum and sub-mentum. The prementum bears 3 segmented labial palp. On anterior margin two pairs of lobes i.e.glossae (inner side) and para glossae (outer side) collectively called as Ligula. Function of the labium is to close the mouth cavity ventraly and also help the maxillae in feeding process.

4 **Describe the structure of insect integument with labeled diagram and mention its functions.**

Ans :Diagram: **2 marks**

Structure: **4 marks**

1. Cuticle – Epicuticle – Cement layer, wax layer, cuticulin layer, polyphenol. Procuticle- Exocuticle and Endocuticle
2. Epidermis or Hypodermis
3. Basement membrane

Functions: **2 marks**

1) It gives shape to the insect. **2)** Body wall provides protection to the organs enclosed by it. **3)** Conserves moisture and prevents desiccation. **4)** It provides surface for attachment of muscles. **5)** It forms sense organs. **6)** Prevents entry of pathogens and insecticides.

5 **Define metamorphosis and describe its types with suitable examples.**

Ans: Define: **2 marks**

The conspicuous changes in the form and appearance assumed by insects (or animals) between hatching and maturity is known as metamorphosis.

Types of metamorphosis : **6 marks**

1) Ametabola e.g. Silverfish are said to undergo no metamorphosis.

2)Hemimetabola e.g. Grasshopper, bugs pass through gradual or incomplete metamorphosis. The immature form are called as nymph. Life cycle is completed in three stages Egg-Nymph-Adult.

3) Holometabola : Complete metamorphosis- The life cycle is completed in four stages viz. Egg. Larva-Pupa-Adult.Wing develop internally. Each stage differs completely from other e.g. Butterfly, Beetles.

4) Intermadiate metamorphosis: Some insect show deviation from the generai rule in that they donot bear wing pads in their earlier immature instars,assume different morphological forms and dissimilar to their parents, also passes through a quiescent or semiquiescent stage to the pupal stage before emerging as adult.e.g. Thrips, Whitefly,Scale insects.

5) Hypermetamorphosis : In insects like blister beetle the larva passes through totally differernt successive instars, hence known as hypermetamorphosis.

6 **Explain structure of typical insect antenna with well labeled diagram and enlist its types with one example each.**

Ans : Diagram

Structure **2 marks**

4 marks

Scape : Basal portion formed by single segment. It facilitates the articulation of antenna to head capsule.

Pedicel : Second division formed by single segment. It consists of auditory organ (Johnston's organ) in majority of winged insects.

Flagellum : Third division. Formed by single or many segments. In some insects it is formed by basal ring, intermediate funicle and distal swollen club.

Types of Antennae : **2 marks**

Filiform : e.g. Grasshopper, Moniliform : e.g Termites,Setaceous:e.g.Cockroach,

Serrate: e.g. Metallic beetle, Pectinate : e.g. Silk moth, Capitate : e.g. Weevils, Geniculate : e.g. Honey bee, Lamellate : e.g. Dung roller, Aristate : e.g. House fly , Stylate : e.g. Jassid , Plumose : e.g. Male mosquito, Pilose : e.g. Female mosquito and Clavate: e.g. Butterflies.

Q. 7 State the economic importance and distinguishing characters of order Hemiptera and enlist its four important families with one example each.

Ans: Economic importance: **2 marks**

This order includes minute to large sized insects. The members of this order cause direct and indirect damage to crop plants. They act as vector of diseases. Lac insect is useful insect yields lac or shellac.Besides it also includes bed bugs, which is aparasites on man and reduvid bug on other insect.

Characters: **4 marks**

1) Anterior wings harder than posterior.Hemielytrate in Heteroptera.
2) Head position opisthognathus. 3) Mouthparts piercing and sucking type. 4) Antennae fairly long 5 to fewer segmented. 5) Thorax well developed, in some cases prnotum triangular. 6) Legs mostly similar to each other, in Gaint water bug – front pair of legs – grasping type. 7) Ovipositor well developed. 8) Metamorphosis incomplete.

Important families: **2 marks**

1) Cicadellidae : e.g. Mango hopper. 2) Aphididae : e.g. Aphids. 3) Aleurodidae : e.g.Whitefly. 4) Pseudococcidae : e.g. Mealy bug.

Q. 8 Explain female reproductive system of cockroach with well labeled diagram.

Ans : Diagram: **2 marks**

Description: **6 marks**

Female reproductive system: Consists of a pair of ovaries lies in abdominal cavity. Ovary consists of eight ovarian tubules or ovarioles having three parts, the terminal filament – the egg tube and the supporting stalk – unites the egg tubes with oviduct. The two oviduct unite and form a common oviduct that opens in the genital chamber through a gonopore. The genital chamber also receives a duct of spermatheca – is a sac for the reception and storage of sperms.

Accessary glands

Collecterial glands : There is a pairs of accessory glands which open in the genital chamber and produce adhesive substance for attaching the eggs to support or binding them together in an egg case or ootheca.

Q. 9 Write short notes ~~on~~ (Any Two). **(4 marks each)**

Ans:

a) **1) Sense organs in insects :** The sense organs receive the stimuli from the surrounding and respond to them. They are:- 1) Photo receptor:- eg.Compound eyes, 2) Auditory organs:-eg.Tympanum, 3) Chemoreceptors, 4) Gustatory(taste) organs and 5) Thermoreceptors.

b) **2) Wing coupling apparatus :** . In primitive insects both pairs of wings used independently to each other. During the course of evolution, however a coordination of movement was achieved by developing a mechanism called as wing coupling

apparatus.

The different types of wing coupling apparatus found in insects are :-

1) Jugate type : The forewings develops on its anal margin a small jugal lobe, while the anterior margin of the hind wing is transformed into a small humeral lobe. eg. Hepialid moth.

2)Fibulate type : In this case jugal area of front wing is produced into a lobe like fibula or more elongated jugum. eg.caddies flies.

3)Frenate type : A spine like organ, group of bristles are born of the humeral angle of hind wing known as frenulum engaged into the structure called retinaculum developed on lower surface of fore wings.

4)Hamulate type : A series of hook like structures called Hamuli are present on the costal margin of hind wing, which engage with anal margin at fore wing during flight eg.Bees.

5)Amplexiform type : In butterflies and silkworm wings are coupled simply by overlapping basally the forewing on hind wings during flight.

8) **Structure of typical insect leg :** The true leg of an insect is five segmented and consists of :

1) Coxa : It is the basal segment of leg and articulates to the pleurite by means of coxal process of pleuron and trochantin.

2) Trochanter : It is usually a small, single quadrangular segment present in between the coxa and femur.

3) Femur : It is strongly developed segment which accommodates powerful muscles. The lower end of femur articulates with tibia and forms a knee joint.

4) Tibia : It is the 4th segment of insect leg and often equals or exceeds the length of the femur.

5) Tarsus and pretarsus : All the parts beyond the tibia are placed is called as foot, which rests on the ground while walking. The upper part is called tarsus and lower one is called as pretarsus. The tarsus may be 1 to 5 segmented. Pretarsus bears two sharp curved hooks or claws.

10 Write economic importance and distinguishing characters of order Coleoptera and enlist its four important families with one example each.

Ans : Economic importance : Largest order of insects known as beetles and weevils. Many are phytophagous, some are predaceous or scavangers, some feed on mold or fungi. Lady bird beetles are however predators on aphids. **2 marks**

Characters: 1)Head position prognathous and hypognathous types with biting types of mouth parts. 2) Antennae usually 11 segmented, shows great variations like filiform, monoliform, clavate,lamellate and serrate. 3) The front pair of wings are modified into horney sheaths known as elytra. Hind wings membranous. 4) Prothorax is large and freely movable. 5) Legs modified into digging, jumping, swimming, walking or running type. 6)Pupae adecticous and exarate, rearly obtect.7) Ovipositor developed but concealed. 8) Metamorphosis complete. **4 marks**

Important families: **2 marks**

1) Coccinellidae : e.g. Lady bird beetle. 2) Scarabaeidae : e.g. Whitegrubs.
3) Cerambycidae: e.g. Mango stem borer. 4) Curculionidae : e.g. Weevils.

SECTION "B"

Q. 11 a) State the exact function of the followings.

Ans:

1) Peritrophic membrane : Protects the epithelial cells of mid gut from abrasion.
2) Halteres : Act as balancer during flight in Diptera.
3) Taenidia : Used to strengthen walls of tracheae and prevent their collapse and keep the tracheae always open.
4) Johnston's organ : Auditory organ in winged insects.

b) Define the following terms.

1) Systematics : The scientific study of kinds and diversity of organisms and of any or all relationship among them.
2) Genus : It is the taxonomic category containing a single species, or a monophyletic group of species , which is separated from other taxa of the same rank by a decided gap.
3) Taxonomy : The theoretical study of classification, including its basis, principles, procedures and rules.
4) Species : Are groups of interbreeding natural populations that are reproductively isolated from other such groups.

Q. 12 Mention order of the following insects.

And :

1) Mantid : Dictyoptera
2) Termite : Isoptera
3) Butterfly : Lepidoptera
4) Honeybee : Hymenoptera
5) Dragonfly : Odonata
6) Field cricket : Orthoptera
7) Thrips : Thysanoptera
8) House fly : Diptera

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