**Study of the permanent slides of mouthparts of the following insects:**

 **Cockroach , mosquito , bed-bug , butterfly , honey bee and housefly.**

 Insects constitute the largest number in the animal kingdom. They show diverse modes of feeding and hence great diversity in shape & morphology of their mouth parts. The appendages surrounding or associated with the mouth are called mouth parts. Typical insect mouth parts consist of labrum (upper lip), paired mandibles, paired maxillae, labium (lower lip), and hypopharynx. Following are the main modifications of mouth parts in insects.

1. **Biting and chewing** **type mouth parts** ( Cockroach ) – Most primitive & unspecialized type of mouth parts adapted for biting & chewing the omnivorous food.Mouth parts consist of --
2. **Upper lip or Labrum-** It isbroad, flap like, forms the roof of mouth cavity.
3. **Mandibles**- Triangular, heavily sclerotised, with teeth like denticles useful for biting and chewing food. They are moved by a pair of abductor & aductor muscles.
4. **Maxillae**- Consist of cardo, stipes, five jointed maxillary palp, lacinia and galea. Maxillary palps are tactile & locate & hold the food. Lacinia and galea bear taste buds & test the quality of food.
5. **Lower lip or Labium**- Formed by the fusion of two pieces viz. Prementum & Postmentum. Postmentum consists of submentum & mentum. Prementum laterally bears a pair of three jointed labial plaps. In between the palps lie two glossae & paraglossae. Labial palps help in testing the quality of food, glossae & paraglossae prevent the loss of food particles while feeding & also help in pushing the masticated food into the preoral cavity**.**
6. **Tongue or Hypopharyhx-**It is a tongue like cylindrical structure supported by few narrow sclerites. Common salivary duct opens at its front end**.**
7. **Piercing and Sucking type mouth parts**
8. **Mosquito-**These mouth parts are modified for feeding on liquid food e.g. plant sap, blood etc. There is elongation of most of the mouth parts and loss of some typical structures.
9. **Labrum**- forms an elongated, needle like tube grooved on the ventral side.
10. **Mandibles**- Mandibles are elongated in structure.
11. **Maxillae** – Maxillae are elongated with three jointed maxillary palps. Glossae, paraglossae are reduced .
12. **Labium** - forms an elongated, fieshy and mid-dorsally grooved tube, the proboscis, Lacinia and galea are absent. Labial palps are modified to form two small labellae at the tip of proboscis which are tactile in function.
13. **Hypopharynx**- Elongated.
14. Mandibles, maxillae and hypopharynx form needle like styles enclosed in the tube formed by labrum & labium. These are used for piercing the skin of the victim. Saliva is injected & the liquid food is sucked in.
15. **Bed Bug -**These mouth parts are modified for feeding on liquid food blood . There is elongation of most of the mouth parts and loss of some typical structures.
16. **Labrum** is a flap like structure covering the groove of probosis at the base only.
17. Proboscis is formed by the elongation of labium.
18. **Mandibles and maxillae** from blade like and saw like stylets respectively saw like stylets are doubly grooved to form two separate channels for food & saliva. Maxillary palps & labial palps are absent.
19. **Hypopharynx** is a short tube within the base of proboscis.

**3.** **Siphoning mouth parts - ( Butterfly** )

 Mouth parts are modified for sucking the liquid food i.e. nectar from flowers and fruits.

1. **Labrum**- is reduced into a narrow, transverse band.
2. **Mandibles** are very much reduced.
3. Maxillary palps are vestigial. **Lacinia** is absent and galae are much elongated, coiled & are medially grooved very deeply. When applied together the two galae enclose a food channel called as proboscis. Muscular pharynx is present at the base proboscis. Proboscis forms a main siphoning tube to suck nectar from flowers. When not in use the proboscis is coiled beneath head.
4. **Labium**- is reduced into a triangular plate, bearing well developed three jointed labial palps.
5. **Hypopharynx** is absent.
6. **Chewing and lapping mouth parts – (Honey bee)**

 This type of mouth parts are modified for collecting the nectar and pollen from flowers and also for moulding the wax. These mouth parts are found in honeybees, wasps, etc.

1. **Labrum** – Lies beneath the labrum, fleshy **epipharynx** which is an organ of taste.
2. **Mandibles** – Mandibles are smooth and spatulate, used in moulding wax and making honeycomb. The labrum and mandibles help in chewing food.
3. **Maxillae** – The maxillae have reduced lacinia, vestigial palps and bear long blade-like galeae.
4. **Labium** –has reduced paraglossae. The **glossae** are united and elongated to form the so called retractile tongue, its tip is a small **labellum** or honey spoon. It is used for gathering honey and is organ of taste and touch. The labial palps are elongated. The galae and labial palps form a tube enclosing the glossae which moves up and down to collect nectar from flowers by the pumping action of pharynx.
5. **Hypopharynx** – Absent.
6. **Sponging mouth parts** ( Housefly )

Mouth parts are modified for sucking up the liquid food.

1. **Labrum**, **epipharynx** and **hypopharynx** form the food canal which leads into the mouth.
2. **Mandibles** are completely absent, maxillae are represented by two maxille palps each made up of a single piece, Lacinia and Galea are absent.
3. **Labium**- is greatly modified to from proboscis. Proboscis is divisible into three parts viz. a) **Rostrum**- proximal, cone shaped bearing maxillary palps. B) **Haustellum**- middle portion with mid-dorsal groove which serves as a food passage, It has a ventral heart shaped plate - theca, c) **Labellum**- Distal portion which is disc like consisting of two expanded lobes or labellae. Underside of labellae show the presence of pseudotrachae- converging in the centre into mouth The pseudotracheae soak the fluid food which passes into the food channel and sucked up by muscular pharynx.