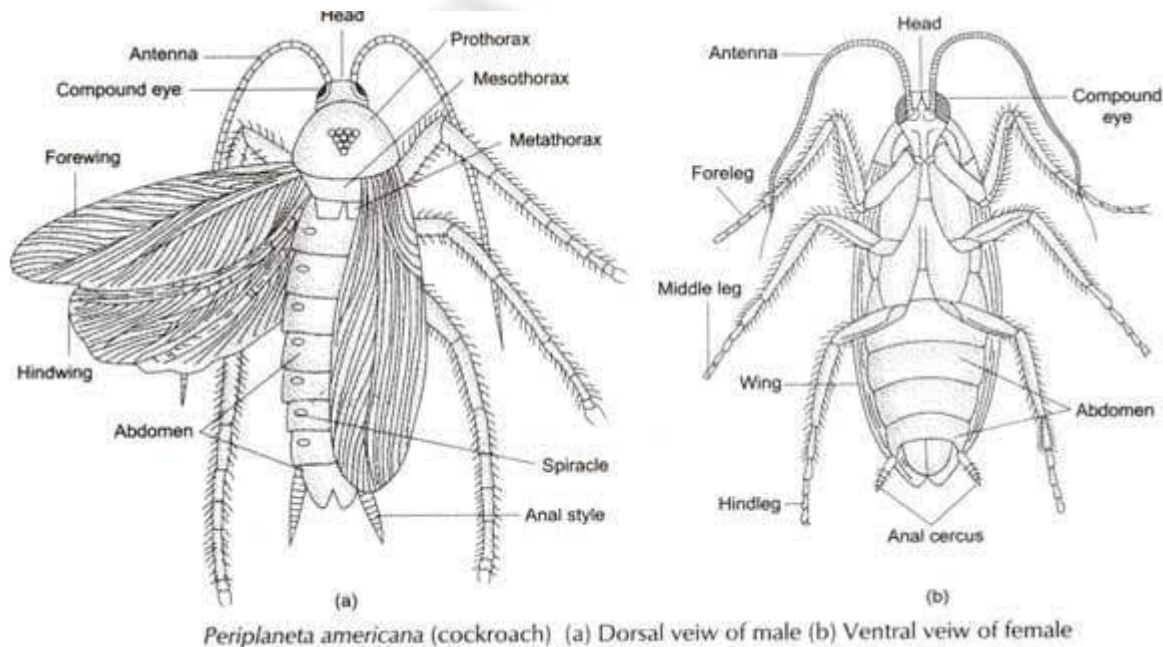


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Morphology and Anatomy of Cockroach

Cockroaches are pests, inhabiting the unhygienic and damp places. They are dark brown in colour belonging to the phylum Arthropoda, the Blattidae family, and class Insecta.

Their morphology and anatomy are discussed in this article.



Morphology

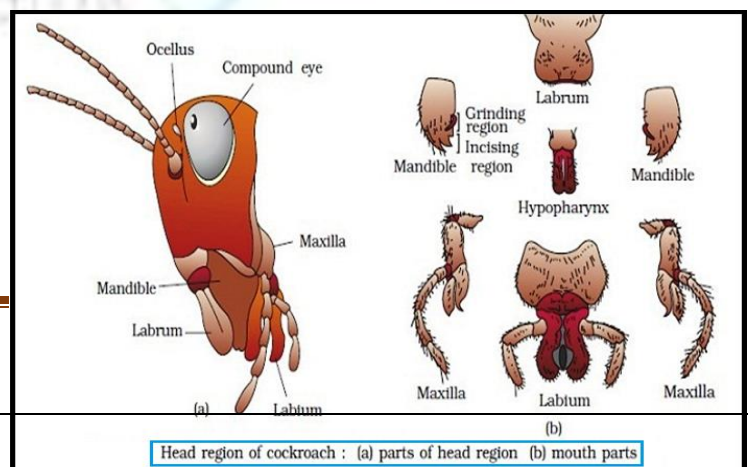
The body of the cockroach is divided into:

- Head
- Thorax
- Abdomen

Head

It bears a pair of compound eyes and two long antennae arising from their head. The mouth is present on the anterior part which bears a pair of mandibles, a pair of maxillae and labium. A median flexible lobe acts as the tongue.

Compiled by Souvik Hazra for MyCoolGuru.com



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Mouth Parts: The mouth parts are at the anterior end of the head. The mouth parts consist of a labrum (upper lip), a pair of mandibles, a pair of maxillae and a labium (lower lip). A median flexible lobe lies in the cavity which is enclosed by the mouth parts. This lobe acts as tongue (hypopharynx).

Thorax

The thorax is divided into three parts- Prothorax, Mesothorax, and Metathorax. The head and thorax are connected by prothorax, which is a short extension known as the neck. The mesothorax gives rise to the first pair of wings, while the second pair of wings arise from the metathorax. The thorax region also bears a pair of legs. It also consists of forewings called tegmina.

Abdomen

The abdomen of a cockroach is divided into 10 segments. The 7th sternum, along with the 8th and 9th sterna bears a broad genital pouch. The 10th segment contains a pair of the joint filamentous structure called anal cerci.

Anatomy

Digestive System

It has a long and coiled alimentary canal divided into three parts- foregut, midgut, and hindgut.

- **Foregut or Stomadaeum-** It comprises the buccal chamber, pharynx, oesophagus, crop, and gizzard.
- **Midgut or Mesenteron-** It is short compared to the foregut and lined with glandular endoderm. Eight blind globular hepatic caeca are present between gizzard and midgut, which secretes digestive enzymes.
- **Hindgut or Proctodaeum-** It consists of ileum, colon, rectum.

Nervous System

The nervous system of a cockroach is divided into- central nervous system, peripheral nervous system, and sympathetic nervous system.

1. The **central nervous system** consists of the brain.
2. The **peripheral nervous system** consists of nerves.
3. The **sympathetic nervous system** consists of a frontal ganglion.

Respiratory System

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The respiration in cockroaches occurs through the trachea present on the lateral side of the body. It opens through 10 pairs of small holes called spiracles.

The trachea is sub-divided into tracheoles that carry oxygen from outside to different parts of the body.

Excretory System

The metabolic waste is excreted by ciliated and glandular Malpighian tubules. The waste is excreted in the form of uric acid.

Circulatory System

The cockroach has an open circulatory system. The blood flows through the body cavity. The circulatory system consists of a heart, anterior aorta, and a system of ill-defined blood spaces known as sinuses.

Sensory Organs

- Thigmoreceptors: They perceive sense for touch and are present on the body, legs, antennae and maxillary palps.
- Olfactory Receptors: They are present on antennae and palps and sense various smells.
- Gustatory Receptors: They are present on the maxilla and labial palps and can perceive a sense of taste.
- Thermoreceptors: These are present on the pads between the first four tarsals and can sense changes in temperature.
- Auditory Receptors: They are present on the anal cerci and responsible for hearing.

Reproductive System

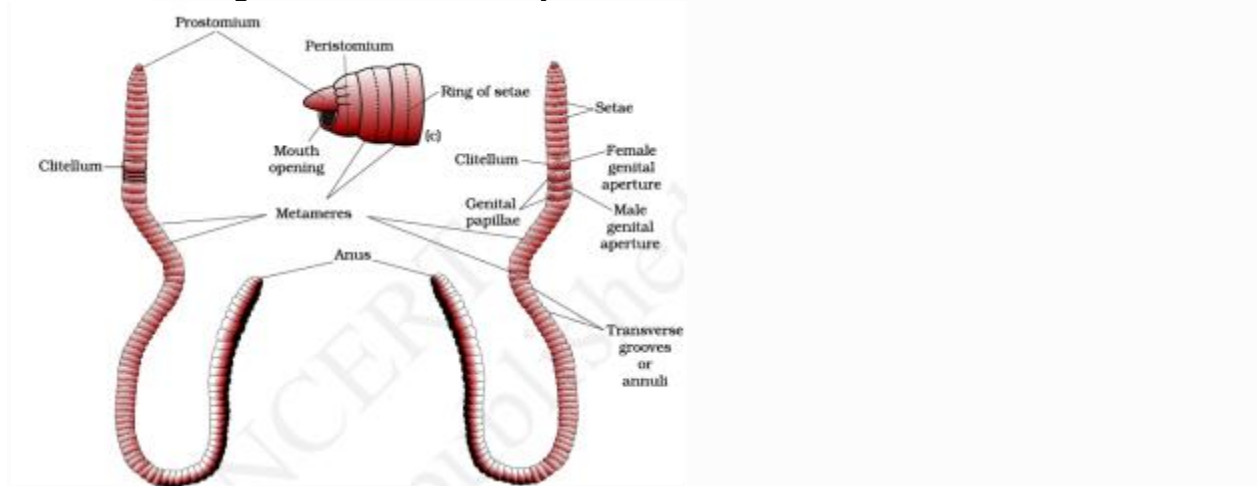
- The male reproductive system consists of a pair of testes present in the 4th and 6th segments of the abdomen laterally.
- The sperms are stored in the seminal vesicles.
- The female reproductive system consists of two ovaries in the 2nd and 6th segment of the abdomen.
- Oviducts of each ovary connect to form a single median oviduct.
- Sperms transfer through spermatophores.
- The fertilized eggs are present in a case like structure called oothecae.

This was the entire structure of a cockroach.

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Earthworm

- Earthworm is reddish brown terrestrial invertebrate that lives in upper layer of moist soil. The common Indian earthworms are *Pheretima* and *Lumbricus*.
- Earthworms have long cylindrical body divided into segments called metameres. The ventral surface contain genital pore and dorsal surface contain mid dorsal line.
- First body segment is called **peristomium** which contain mouth. 14-16 segments are covered by dark band called **clitellum**.



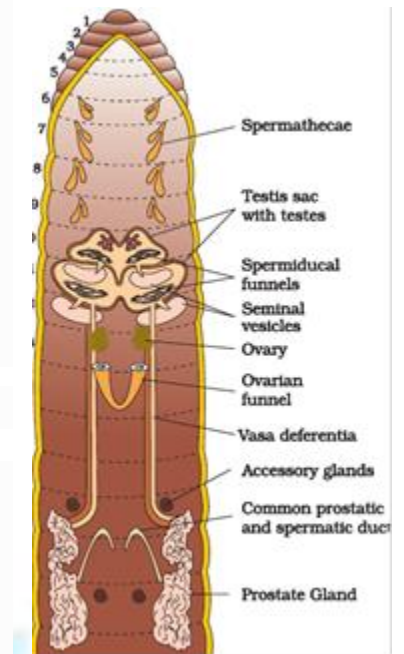
- Single genital pore is present on mid ventral line of 14th segments. A pair of male genital pore is present on 18th segment on ventro-lateral side.
- All the segment except 1st , last and clitellum contain S-shaped **setae** for locomotion.
- Alimentary canal is straight tube from 1st to last segment having, buccal cavity, muscular pharynx, oesophagus that leads to gizzards, which help in grinding the soil particles and decaying leaves. Stomach and small intestine leads to anus.
- Between 26-35 segments, the intestine has an internal median fold called **typhlosole**. This increases the effective area of absorption in the intestine.
- Closed vascular system consists of heart, blood vessels and capillaries. Blood glands are present on the 4th, 5th and 6th segments. They produce

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blood

cells and haemoglobin which is dissolved in blood plasma.

- Earthworms lack respiratory organs and respire through moist skin.
- Excretory organ is coiled segmental tubules called **nephridia**. There are three types of nephridia: Septal nephridia, integumentary nephridia and pharyngeal nephridia.
- Nervous system is represented by ganglia arranged segmentwise on the ventral paired nerve cord. The nerve cord in the anterior region (3rd and 4th segments) bifurcates and joins the cerebral ganglia dorsally to form a **nerve ring**.
- Earthworm is hermaphrodite. Two pairs of testis is present in 10th and 11th segment. Prostate and spermatic duct open to surface as male genital pore on 18th segment.
- One pair of ovaries is attached to the intersegmental septum of 12th and 13th segments. Female genital pore open on ventral side of 14th segment. Mutual exchange of sperms takes place during mating.

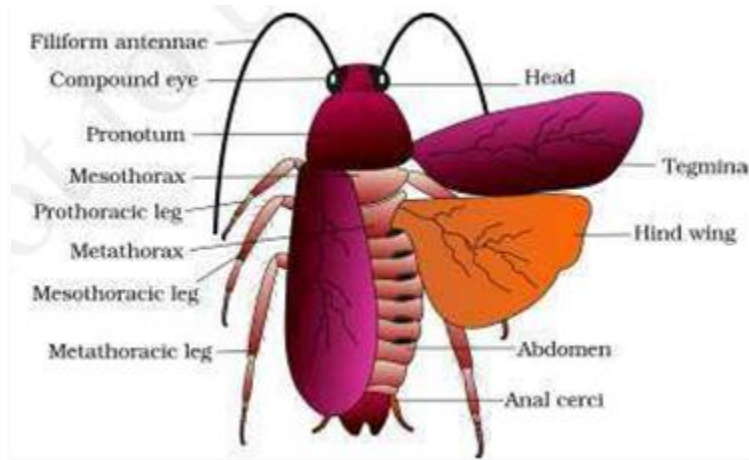


- Mature sperms and egg cells along with nutritive materials are deposited in cocoon in the soil where fertilisation takes place.
- Earthworms are known as friends of farmer because they make burrows in soil to make it porous for respiration and root penetration. Earth worms are also used for vermicomposting and as bait in game fishing.

Cockroach(*Periplaneta americana*)

- Cockroaches are nocturnal omnivorous organisms that lives in damp places everywhere. The body of cockroach is segmented and divisible into **head, thorax and abdomen**. The body is covered by hard chitinous exoskeleton.

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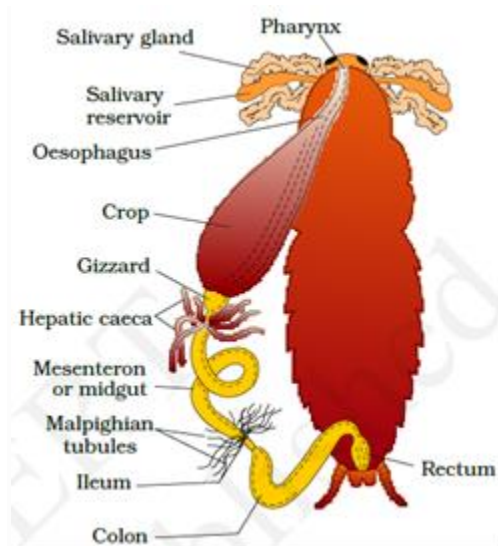


- Head is triangular in shape formed by fusion of six segments to show flexibility. Head bears compound eyes. Antenna attached on head help in monitoring the environment.
- Thorax consists of three parts- prothorax, mesothorax and metathorax. Forewings and hind wings are attached with thorax. Abdomen consists of 10 segments.

Male Cockroach	Female Cockroach
<ol style="list-style-type: none"> 1. The abdomen is long and narrow. 2. Brood pouch is absent. 3. Male have longer antenna. 4. Anal styles are present. 	<ol style="list-style-type: none"> 1. The abdomen is short and broad. 2. Brood pouch is present. 3. Female have shorter antennae. 4. Anal styles are absent.

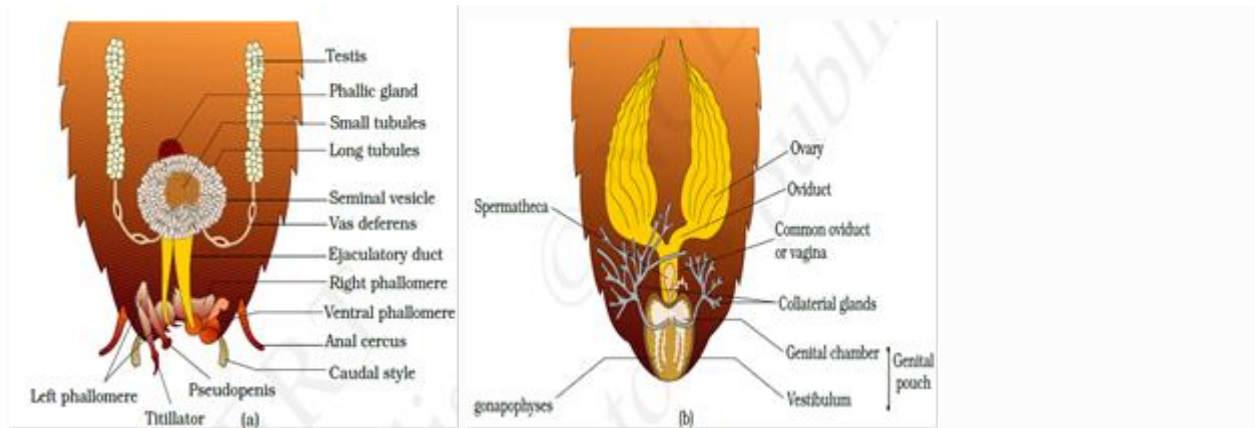
Digestive System of Cockroach-

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- Alimentary canal is divided into foregut, midgut and hindgut. Food is stored in crop. Gizzard help in grinding the food particles.
- At the junction of midgut and hindgut yellow coloured filamentous **Malpighian tubules** are present which help in excretion.
- Blood vascular system is open type having poorly developed blood vessels. The haemolymph is made of colourless plasma and haemocytes.
- Respiratory system consists of network of trachea which open through 10 pairs of **spiracles** on lateral side.
- The nervous system of cockroach consists of a series of fused, segmentally arranged ganglia joined by paired longitudinal connectives on the ventral side. Three ganglia lie in the thorax, and six in the abdomen. The nervous system of cockroach is spread throughout the body.
- Each compound eye of cockroach consists of about 2000 hexagonal ommatidia.
With the help of several ommatidia, a cockroach can receive several images of an object. This kind of vision is known as **mosaic vision** with more sensitivity but less resolution,
- Cockroaches are dioecious. Male reproductive system consists of a pair of testes one lying on each lateral side in 4th-6th abdominal segments. The female reproductive system consists of two large ovaries situated on 2nd - 6th abdominal segments.

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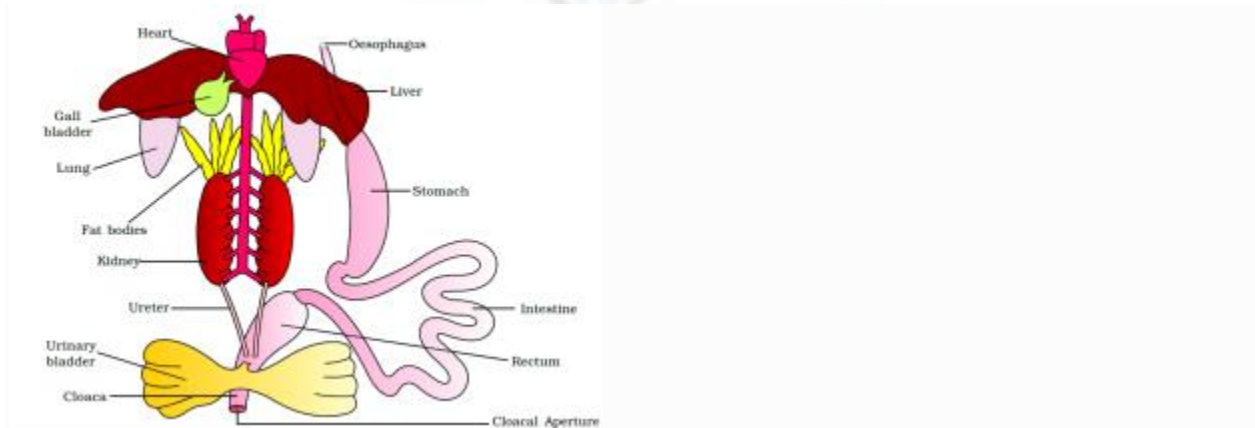
Male reproductive system / Female reproductive system

- The fertilized eggs are encased in capsule called oothecae. 9 to 10 oothecae are produced by each female.
- Cockroaches are pests and destroys the food, contaminate with smelly excreta.

Frog (*Rana tigrina*)

Frogs are cold-blooded organism having ability to change colours to hide from enemies. Body is divisible into head and trunk, bulged eyes covered by nictitating membrane. Male frog is different from female having vocal sacs and copulatory pad on first digit of forelimb.

- Digestive system consists of alimentary canal and digestive glands.



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- Digestion starts in stomach and final digestion occurs in small intestine. Digested food is absorbed by villi and microvilli present in the inner wall of small intestine.
- Skin acts as aquatic respiratory organs (cutaneous respiration). On lands skin, buccal cavity and lungs acts as respiratory organs.
- The vascular system of frog is well-developed closed type. Heart is 3-chambered. Blood consist of plasma, RBC, WBC and Platelets.
- Frogs have a lymphatic system consisting of lymph, lymph channels and lymph nodes.
- The elimination of nitrogenous wastes is carried out by a well developed excretory system. The excretory system consists of a pair of kidneys, ureters, cloaca and urinary bladder. The frog excretes urea and thus is a **ureotelic** animal.
- The system for control and coordination is highly evolved in the frog. It includes both neural system and endocrine glands
- Frogs have well organised male and female reproductive systems. Male reproductive organs consist of a pair of yellowish ovoid testes, which are found adhered to the upper part of kidneys by mesorchium. The female reproductive organs include a pair of ovaries which are situated near kidneys.
- Fertilisation is external and takes place in water. Development involves a larval stage called tadpole. Tadpole undergoes metamorphosis to form the adult.
- **Reproductive systems of frog-**

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