MODEL ANSWER
B.Sc. (Semester III)
LZC-302: Endocrinology and Insect Biology

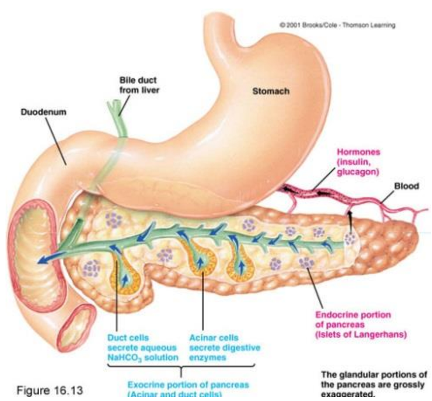
SECTION-A (Multiple choice question)

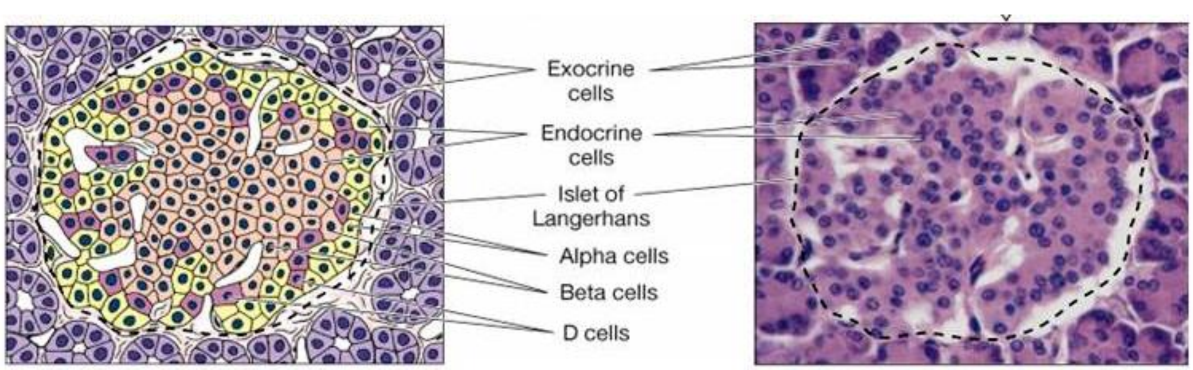
Question No. 1. Answer

i. d	**ii. a**	**iii. b**	**iv. a**	**v. b**	**vi. b**
vii. b	**viii. c**	**ix. b**	**x. d**		

Section B

Answer 1. Pancreas is known as mixed gland





1. Three cell types are present, A (glucagon secretion), B (Insulin secretion) and D (Somatostatin secretion)

2. A and D cells are located around the perimeter while B cells are located in the interior
3. Venous return containing insulin flows by the A cells on its way out of the islets

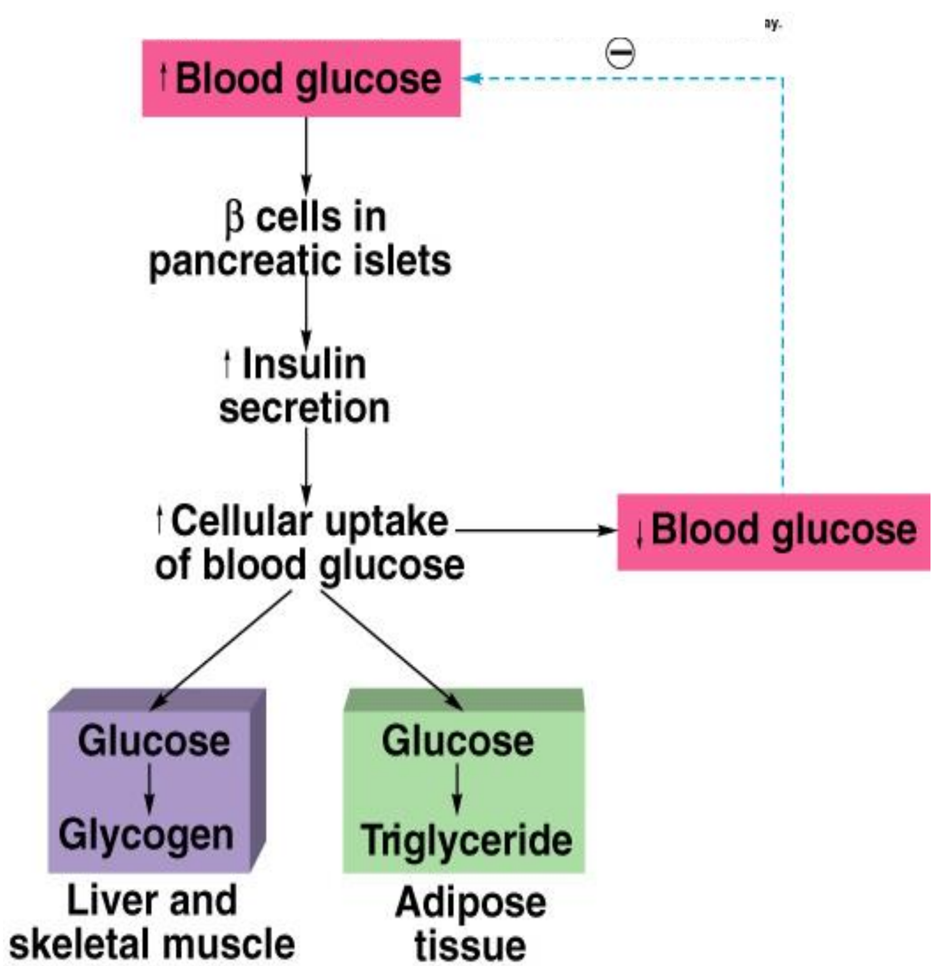
Functions

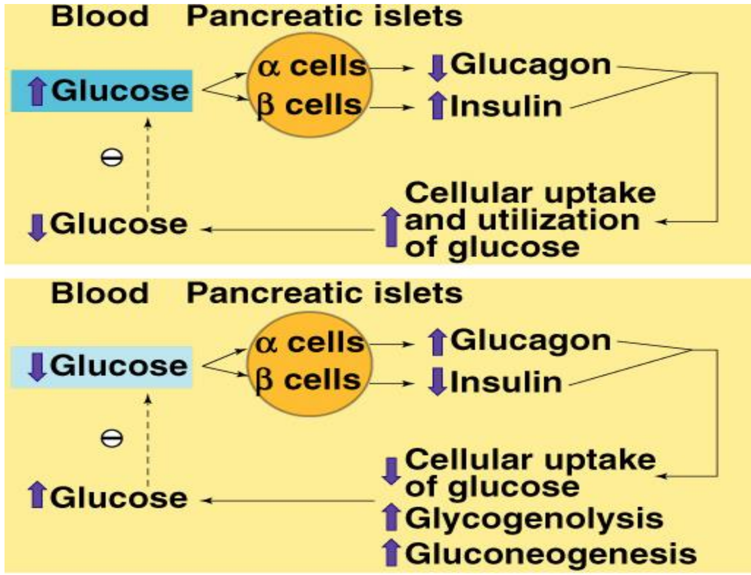
1. Alpha cells secrete glucagon.

- Stimulus is decrease in blood [glucose].
- Stimulates glycogenolysis and lipolysis.
- Stimulates conversion of fatty acids to ketones.

2. Beta cells secrete insulin.

- Stimulus is increase in blood [glucose].
- Promotes entry of glucose into cells.
- Converts glucose to glycogen and fat.
- Aids entry of amino acids into cells.



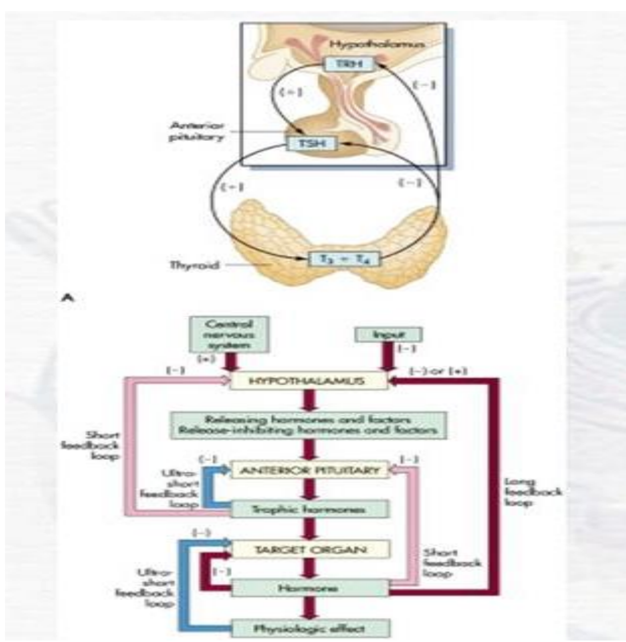


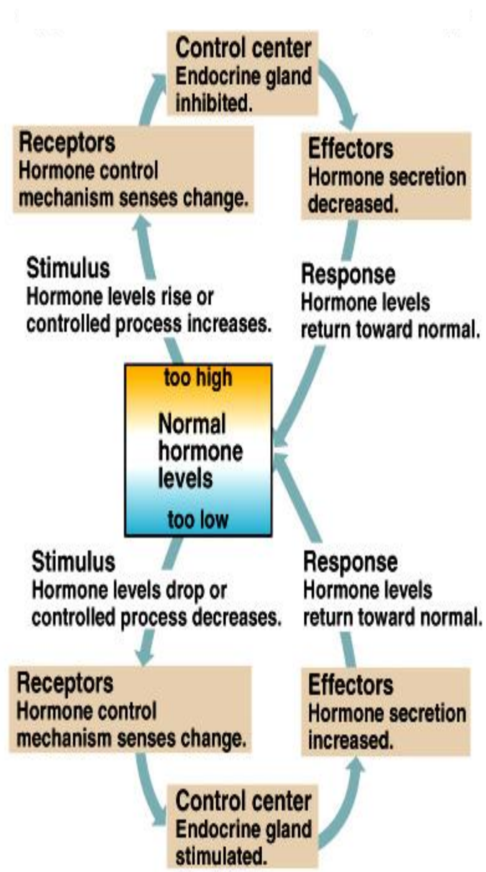
Q 3:Different Feed Back Mechanism:

Most cells are capable of producing one or more molecules, which act as signaling molecules to other cells, altering their growth, function, or metabolism. The classical hormones produced by cells in the endocrine glands . The rate of hormone biosynthesis and secretion is often regulated by a homeostatic negative feedback control mechanism. Such a mechanism depends on factors that influence the metabolismand excretion of hormones. Thus, higher hormone concentration alone cannot trigger the negative feedback mechanism. Negative feedback must be triggered by overproduction of an "effect" of the hormone.

- Hormones are released:
  1. In response to an alteration in the cellular environment
  2. To maintain a regulated level of certain substances or other hormones
  3. Hormones are regulated by chemical, hormonal, or neural factors
  4. Negative feedback
  5. Positive feedback

Feedback regulation





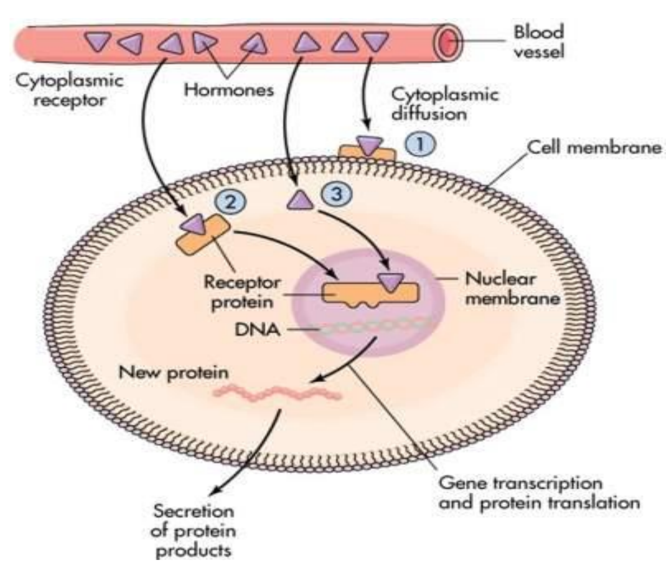
Q4. Steroid Hormone and Mechanism of Steroid hormone action

Steroid hormones:

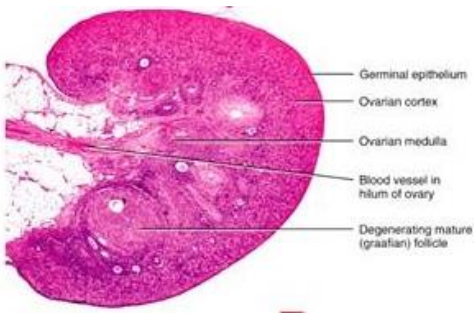
1. Androgens,
2. Estrogens,
3. Progesterone,
4. Glucocorticoids,
5.Mineralocorticoids

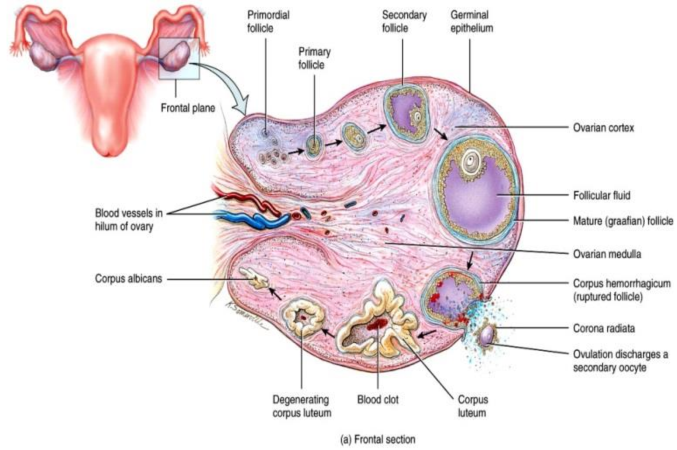
Mechanism of Action of Steroid Hormones

1. Diffuse across the plasma membrane
2. Bind to cytoplasmic or nuclear receptors
- Activate –
 RNA polymerase
 – DNA transcription and translation



Q5. Describe structure and function of the ovary and oogenesis





- Germinal epithelium – covers surface of ovary -Does not give rise to ova – cells that arise form yolk sac and migrate to ovaries do
- Tunica albuginea
- Ovarian cortex -Ovarian follicles and stromal cells
- Ovarian medulla-Contains blood vessels, lymphatic vessels, and nerves
- Ovarian follicles – in cortex and consist of oocytes in various stages of development Surrounding cells nourish developing oocyte and secrete estrogens as follicle grows
- Mature (graafian) follicle – large, fluid-filled follicle ready to expel secondary oocyte during ovulation
- Corpus luteum – remnants of mature follicle after ovulation- Produces progesterone, estrogens, relaxin and inhibin until it degenerates into corpus albicans

Question No. 6. Answer

All insects have sense organs that allow them to see, smell, taste, hear and touch their environment. There are organs connected with these sense that take in information that is sent to the brain so that the body can act on it. All sense organs (receptors) act as transducers -- converting light energy, chemical energy, or mechanical energy from the environment into electrical energy of nerve impulses in sensory neurons. Signals generated by insect sensory receptors travel to the brain or ventral nerve cord where they stimulate appropriate behavioral responses: finding resources (e.g. food, mate, etc.), avoiding danger, or reacting to changes in the environment. All sensory receptors are derived from embryonic ectoderm and are integral parts of the insect's exoskeleton. They can be grouped into one of three categories, depending on function.

Photoreceptors: Arthropods have compound eyes, which have greater depth of focus than refracting eyes, but which sacrifice resolving power or acuity. A pair of compound eyes are the principle visual organs of most insects; they are found in nearly all adults and in many immatures of ametabolous and hemimetabolous orders. As the name suggests, compound eyes are composed of many similar, closelypacked facets (called ommatidia) which are the structural and functional units of vision. The number of ommatidia varies considerably from species to species.

Externally, each ommatidium is marked by a convex thickening of transparent cuticle, the corneal lens. Beneath the lens, there is often a crystalline cone secreted by a pair of semper cells. Together, the lens and the crystalline cone form a dioptric apparatus that refracts incoming light down into a receptor region containing visual pigment.

Since insects cannot form a true (i.e. focused) image of the environment, their visual acuity is relatively poor compared to that of vertebrates. On the other hand, their ability to sense movement, by tracking objects from ommatidium to ommatidium, is superior to most other animals.

Temporal resolution of flicker is as high as 200 images/second in some bees and flies (in humans, still images blur into constant motion at about 30 images/second). They can detect polarization patterns in sunlight, and discriminate wavelengths in a range from ultraviolet to yellow.

Ocelli (Simple eyes): Two types of "simple eyes" can be found in the class Insecta: dorsal ocelli and lateral ocelli (stemmata). Although both types of ocelli are similar in structure, they are believed to have separate phylogenetic and embryological origins.

Dorsal ocelli are commonly found in adults and in the immature stages (nymphs) of many hemimetabolous species. They are not independent visual organs and never occur in species that lack compound eyes. Whenever present, dorsal ocelli appear as two or three small, convex swellings on the dorsal or facial regions of the head. They differ from compound eyes in having only a single corneal lens covering an array of several dozen rhabdom-like sensory rods. These simple eyes do not form an image or perceive objects in the environment, but they are sensitive to a wide range of wavelengths, react to the polarization of light, and respond quickly to changes in light intensity

Lateral ocelli (stemmata) are the sole visual organs of holometabolous larvae and certain adults (e.g. Collembola, Thysanura, Siphonaptera, and Strepsiptera). Stemmata always occur laterally on the head, and vary in number from one to six on each side. Structurally, they are similar to dorsal ocelli but often have a crystalline cone under the cornea and fewer sensory rods. Larvae use these simple eyes to sense light intensity, detect outlines of nearby objects, and even track the movements of predators or prey. Covering several ocelli on each side of the head seems to impair form vision, so the brain must be able to construct a coarse mosaic of nearby objects from the visual fields of adjacent ocelli.

Mechanoreceptors

Insect mechanoreceptors can be found almost anywhere on the surface of an insect's body. They may act as tactile receptors, detecting movement of objects in the environment, or they may provide proprioceptive cues (sensory input about the position or orientation of the body and its appendages). These receptors are innervated by one or more sensory neurons that fire in response to stretching, bending, compression, vibration, or other mechanical disturbance. Some mechanoreceptors produce a phasic response when stimulated i.e., they fire once when activated and again when deactivated. Other receptors generate a tonic response, firing repeatedly as long as a stimulus persists. Neural processing centers in the brain or segmental ganglia interpret the combinations of tonic and phasic signals sent from nearby receptors.

Trichoform sensilla are probably the simplest mechanoreceptors. Hair beds (clusters of tactile setae) are often found behind the head, on the legs, or near joints where they respond to movements of the body.

Pressure receptors provide sensory information about an aquatic insect's depth in the water. These receptors are usually associated with a cushion of air against the body or within the tracheal system.

Increasing water pressure deflects hair-like processes within the receptor and stimulates tonic and phasic impulses.

Chordotonal organs include several types of mechanoreceptors in which one or more bipolar neurons bridge a gap between two internal surfaces of the exoskeleton.

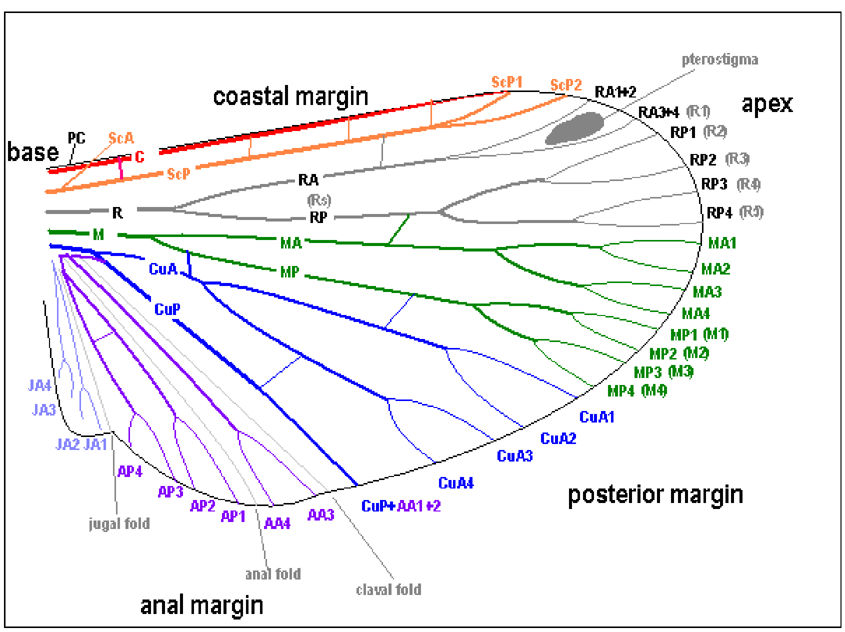
Each neuron is usually accompanied by two other cells which form a sheath (the scolopale cell) and a point of attachment (the cap cell). Together, these three cells create a unit (called a scolopidia) that may occur singly or in groups. Common types of chordotonal organs include:

Tympanal organs lie beneath a drum-like membrane (the tympanum) where they respond to sound vibrations. These "ears" may be located on the thorax (in some Hemiptera), on the abdomen (in grasshoppers, cicadas, and some moths), or on the front tibia (in crickets and katydids).

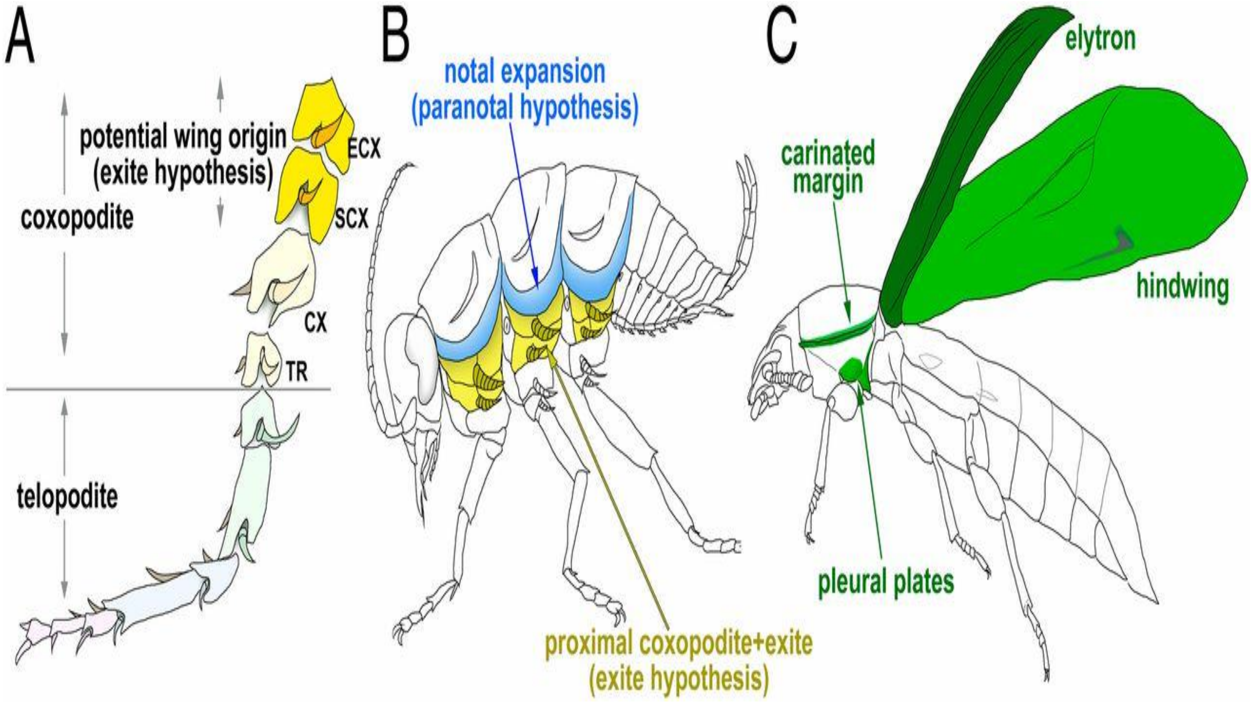
Johnston's organ found within the pedicel of each antenna. In some insects, they function as proprioceptors, supplying information on position or orientation of the antennae. In mosquitoes and midges, they respond to certain frequencies of airborne sound by detecting resonant vibrations in antennal hairs.

Question No. 7. Answer

Insect wings are a core example of morphological novelty, yet their acquisition remains a biological conundrum. More than a century of debates and observations has culminated in two prominent hypotheses on the origin of insect wings.Two hypotheses have been proposed for the origin of insect wings. One holds that wings evolved by modification of limb branches that were already present in multibranched ancestral appendages and probably functioned as gills. The second proposes that wings arose as novel outgrowths of the body wall, not directly related to any pre-existing limbs. If wings derive from dorsal structures of multibranched appendages, we expect that some of their distinctive features will have been built on genetic functions that were already present in the structural progenitors of insect wings, and in homologous structures of other arthropod limbs.



Structure of insect wing



Origin of insect wing

A long-popular hypothesis was that insect wings were derived from paranotal lobes-lateral extensions of the thorax, originally not articulated and probably used for gliding. Proposed support for the paranotal hypothesis came from the presence in a number of Palaeozoic insect groups of just such lateral projections, complete with wing-like venation, on the first segment of the thorax in addition to the actual wings on the second and third segments (contrary to many popular accounts, these insects were not 'six-winged', because the anterior lobes were fixed in place and not mobile like wings). Smaller projections in thysanurans (silverfish), the living sister group to winged insects, do allow them limited gliding ability. So of the currently contending explanations for the origin of insect wings, the genetic and developmental data seems to be consistent with an exite origin, but fossil and phylogenetic considerations appear more consistent with a paranotal origin.

Question No. 8. Answer

A parasitoid is an organism that spends a significant portion of its life history attached to or within a single host organism in a relationship that is in essence parasitic unlike a true parasite. However, it ultimately sterilises or kills and sometimes consumes, the host. Thus parasitoids are similar to typical parasites except in the more dire prognosis for the host.

The parasitoidal type of relationship seems to occur largely in organisms that have fast reproduction rates, such as insects or (perhaps more rarely) mites or nematodes. Workers in this field have pointed out that parasitoids often are closely coevolved with their hosts, which is inarguably true. To maintain a sound perspective of the matter though, one must remember that coevolution might reasonably be expected to develop to even higher degrees of sophistication in the more intimate classes of parasitic relationships. In fact advanced degrees of coevolution occur in the complex interplay between simultaneously extant predator-prey relationships as well.

Many adult bee and wasp species are attracted to the color yellow. Yellow pan traps (YPTs) were effective at trapping the two larval parasitoids. YPTs are simple and inexpensive to make.

An insecticide is a chemical used against insects. They include ovicides and larvicides used against the eggs and larvae of insects, respectively. Insecticides are used in agriculture, medicine, industry, and general home use. Problems with the use of insecticides has brought losses, such as, negative impact on natural enemies. When these beneficial insects reduce cause the eruption of pests and resurgence it's more common. Thus principles of conservation these arthropods are extremely important in the biological natural control of pests, so that these enemies may present a high performance. Because of the negative impacts caused by insecticides on agriculture and their harmful effects on natural enemies, the objective of this article is to approach two important subjects, divided into three parts.

The variety of insecticides available today is much greater than it was 20 years ago. It includes some made from bacteria, insect-killing fungi or viruses; products such as insecticidal soaps that kill by physical processes; and products like the clay-based Surround that don't directly kill insects, but protect plants.

Most of the insecticides in common use today are toxic to people as well as well as insects, although the degree of toxicity to people depends on the dose of the material and the mechanism of action, among other factors.

Some toxicants affect the nervous system. Others affect water balance, oxygen metabolism, an insect's molting or maturation process, or other aspects of physiology.

Effect of insecticides on insect physiology: The insect comprises different instars at larval stages; all stages are phytophagus, mainly depending upon sucking the plant sap. The digestive enzymes in insects are commonly found in the salivary secretions and regions of digestive tract. The digestive enzymes in insects generally adapted to the specific diet on which the species feed. Different insecticides directly affecting the digestive tract and sucrose secretion in insects, due to those insects found dead or inactive.

A method is described by which non-volatile contact insecticides may be applied as dusts in different crops. The technique makes it possible to observe the initial effects of insecticides on insect respiration.

Spiracle of insects blocked due to dust of insect ides and insects are unable to respire, as a result insect population dies**.**

They interfere with the transmission of nerve impulses. Their point of action is the synapse, the tiny gap between one nerve fiber and the next. Nerve impulses jump such gaps with the aid of chemicals called neurotransmitters. Enzymes normally destroy these chemicals immediately after the nerve impulse crosses the gap. Among the most common neurotransmitters is acetylcholine, which functions in our bodies the same way as it does in insects.

Two-thirds of wild insect pollinator species such as bumblebees, hoverflies, butterflies, carrion flies, beetles, midges and moths have suffered population declines. Honeybees have also experienced unusually high mortality rates, decreased fertility, increased susceptibility to disease and the loss of hives.

Insect Growth Regulators (IGRs): Methoprene and pyriproxifen are examples of IGRs. Insects go through a process of growth and development that necessitates molting, a process of shedding the "skin" and growing a new one. IGRs mimic those hormones or their actions. This results in changes that cause the insects to die, such as trying to change into an adult or pupa when the insect is not physiologically ready. IGRs only affect immature insects.

Microbial Insecticides: These are made from microorganisms that attack insects. They are so specialized to attack insect cuticle and cells that they are not very dangerous to people. Fungal insecticides attack insects from the outside. The spores land on the insect's body and grow right into it, eventually penetrating inside and growing throughout the body.
Oils sprayed on mite and aphid eggs are designed to kill the eggs by smothering them, preventing exchange of oxygen.
Insecticides based on viruses must be eaten by insects. Then the viruses take over the function of certain insect cells (those of the gut first), making many copies of themselves. As a result, the insect's cells burst and die.