Inter (Part-II) 2019

Biology	Group-I	PAPER: II
Time: 2.40 Hours	(SUBJECTIVE TYPE)	Marks: 68

SECTION-I

2. Write short answers to any EIGHT (8) questions: (16)

(i) Differentiate between osmoconformers and osmoregulators.

Ans

Osmoconformers	Osmoregulators
Animal body fluids are kept isotonic to the external environment even for marine saltwater environment. These animals, thus, do not require actively to adjust their internal osmotic state, so are known as osmoconformers.	The animals whose body fluid concentrations differ noticeably the outside environment actively regulate to discharge excess water in hypotonic and excrete salts in hypertonic conditions, therefore, are called as osmoregulators in tabular form.

(ii) Define counter-current multiplier.

Ans The interstitial fluid of the kidney is gradually concentrated from cortical to medullary part, thus inner medulla is highly concentrated with the presence of urea and through a mechanism of counter-current multiplier. This mechanism causes gradual osmotic outflow of water from the filtrate back to kidney as it passes downward in the descending loop of Henle. The ascending loop of Henle does not allow outflow of water from its filtrate, instead actively transport Na^+ into kidney interstitium to sustain its high concentration.

(iii) Skin does not come within the definition of excretory organ. Comments.

Ans Skin may not be considered as an excretory organ.

Removal of salts with water by the sweat glands and of sebum by sebaceous glands seems to be excretory in nature. The removal of water and salts from sweat glands is for the purpose of thermoregulation and of sebum on the skin is for protection against microorganism and removal of fat and fat derivation. So, skin has nothing to do with excretion.

(iv) What is jet propulsion? Explain with an example.

Ans Jet propulsion is movement of an object in direction produced by ejecting a jet of fluid in opposite direction.

Biological system includes the propulsion mechanisms of certain marine animals.

For Example:

Jellyfish has an umbrella-like body called bell. First of all, water enters in the bell, then the bell contracts, the water is forced out like a jet and the animal moves forward. This movement is known as jet propulsion.

(v) Differentiate between effective stroke and recovery stroke.

Ans **Effective stroke**

Five out of nine (5/9) double fibrils contract or slide simultaneously with the result that cilium bend or shorten. It is called effective stroke.

Recovery stroke

The four out of (4/9) nine double fibrils contract and cilium becomes straight. It is called recovery stroke.

(vi) What is sleep movement? Also write an example.

Ans Some members of legume family lower their leaves in the evening and rise them in the morning. These are known as sleep movements, for example, bean plants.

(vii) Give any two requirements to produce recombinant DNA.

Ans In order to produce recombinant DNA, following materials are required:

1. Gene of interest, which is to be cloned.
2. Molecular scissors to cut out the gene of interest.
3. Molecular vector, on which gene of interest could be placed.

(viii) Give the role of restriction endonucleases.

Ans Restriction endonucleases enzyme occur naturally in bacteria as a chemical weapon against involving viruses. They cut both strands of DNA when certain foreign nucleotides are introduced in the cell and break strands of DNA at internal position in random manner.

(ix) List the name of eight cities of Pakistan where desert ecosystem occurs.

Ans Following are the eight cities of Pakistan where desert ecosystem occurs:

1. Mianwali
2. Bukhar
3. Bahawal Nagar
4. Yazman
5. Bahawal Pur
6. Khan Pur
7. Raheem Yar Khan
8. Fort Abbas

(x) Differentiate between alpine and boreal coniferous forests.

Ans

Alpine forests	Boreal forests
Coniferous forests located at high altitude are called alpine.	Coniferous forests located at high latitude are called boreal.

(xi) How man is responsible to increase the number of endangered species?

Ans There is a delicate balance between living organisms and environment. Man has been disturbing this balance since very long. Man's decisions regarding the usefulness or harmfulness of the wildlife have led to severe disturbances in natural habitats. As a result, many animals and plants have either become extinct or else in their number as to be on the verge of extinction. These are known as the endangered species.

Today, there are thousands of endangered plants and animals. Wildlife is a renewable resource but it can become non-renewable under extreme conditions of human intervention.

(xii) Differentiate between deforestation and afforestation.

Ans

Deforestation	Afforestation
Clearance of vast areas of forest for procuring lumber, planting subsistence crops or grazing cattle is called deforestation.	Afforestation is establishment of new forests where no forests existed previously.

3. Write short answers to any EIGHT (8) questions: (16)

(i) How do plants respond to environmental stresses?

Ans All plants need water, light, carbon dioxide and a variety of nutrients from their environment for optimal development and growth. The absence or short supply of any of these factors in environment many exert environment may exert environmental stresses on plants affecting their health and survival. If plants are grown without light, they become extremely long and fail to form chlorophyll. They are said to be etiolated.

(ii) List the four types of hormones with examples.

Ans Following are the four types of hormones:

1. Proteins (insulin and glucagons).
2. Amino acids and derivatives (thyroxin, epinephrine, and nor-epinephrine).
3. Polypeptides (*e.g.*, vasopressin, or anti-diuretic hormone and oxytocin).
4. Steroids (*e.g.*, oestrogens, testosterone and cortisone).

(iii) Differentiate between CNS and PNS.

Ans

CNS	PNS
It is the part of the nervous system which comprises of the associative neurons which control all the activities of the body. In higher organisms, it is composed of the brain and the spinal cord.	It is the part of the nervous system which comprises of the cranial and the spinal nerves. The neurons of the PNS may be sensory neurons which carry message from receptors to the CNS or may be the motor neurons which carry message from CNS to the effectors (muscles, glands).

(iv) Define vernalisation. Which parts of plants received its effects?

Ans Biennials and perennial plants are stimulated to flower by exposure to low temperature. This is called vernalisation. The low temperature of stimulus is received by the shoot apex of a mature stem or embryo of the seed but not by leaves as in photoperiodism.

(v) Differentiate between oviparous and viviparous.

Ans

Oviparous	Viviparous
Reptiles and birds lay shelled eggs to protect the developing embryo from harsh terrestrial conditions. Such animals are called oviparous animals.	In mammals, development of embryo is accomplished inside the female body, which gives birth to young one. Such animals are called viviparous.

(vi) Explain the role of gonadotropins in human female.

Ans In human females, the periodic reproductive cycle is completed in approximately 28 days and involves changes in the structure and function of the whole reproductive system. It is called the menstrual cycle and can be divided into four phases. The events of the menstrual cycle involve the ovaries and uterus and these are regulated by pituitary gonadotropins.

(vii) Write formula to calculate recombination frequency.

Ans $$\text{Recombination frequency} = \frac{\text{Recombinant types}}{\text{Sum of all combinations}} \times 100$$

It is the proportion of recombinant types between two gene pairs as compared to the sum of all combinations.

(viii) Define codominance with an example.

Ans Different alleles of a gene that are both expressed in a heterozygous condition are called codominant.

Example:

Allele A_1 $\xrightarrow{\text{Produces}}$ Substance X.

Allele A_2 $\xrightarrow{\text{Produces}}$ Substance Y.

Codominance occurs when both the alleles express independently in heterozygote (A_1A_2) and form their respective products X and Y. The codominant heterozygote would have both substances at the same time.

(ix) In grasshoppers, male has 23 chromosomes while female has 24 chromosomes. Work out.

Ans The female has 24 chromosomes in the form of 11 pairs of autosomes and a pair of X chromosomes. But the male grasshopper has 23 chromosomes having 11 pairs of autosomes and only one X chromosome. Thus male is XO and female is XX.

(x) Differentiate between food chain and food web.

Ans

Food Chain	Food Web
Food chain is linear relationship of eating and being eaten.	Food web is the combination of many food chains.

(xi) Differentiate between autecology and synecology.

Ans

Autecology	Synecology
The study of single population's relationship to its environment is called autecology.	The study of relationship of different communities (grouping of populations) to their environment is called synecology or community ecology.

(xii) What roles are played by links of food chain?

Ans Food chain is the transfer of food energy from the sources in plants through a series of organisms with repeated stages of eating and being eaten.

A short food chain of two or three links supports a community more efficiently than a long chain of five links where much of the original energy from the producers would never reach those organisms at higher trophic levels. Decomposers are able to obtain energy by converting plant and animal tissues and waste into inorganic mineral ions.

4. Write short answers to any SIX (6) questions: (12)

(i) Write any four causes of aging.

Ans The exact process of aging is still unknown, but the following points are worth mentioning:

1. The cells of tissues have only a finite number of mitotic divisions and hence the cells may have reached their finite number by the time tissue or organ is fully grown.
2. Changes in intracellular substances take place during aging.
3. There is hardening and loss of resilience in dense connective tissue and cartilage.
4. Spontaneous mutation may result in loss of cells and degeneration of tissues.

(ii) What are neoblasts and what is their role in development?

Ans In flatworms and planaria, the unspecialized cells, called neoblasts, are always present in the body of adult and are mobilized and migrate to the site of amputation (cut off), where they differentiate into specialized cell types.

(iii) Write any two differences between normal cells and cancer cells.

Ans Following are the two differences between normal cells and cancer cells:

1. Cancer cells can be distinguished from normal cells because they are less differentiated than normal cell and exhibit the characteristics of rapidly growing cells.
2. Have prominent nucleoli.
3. Presence of invading cells in normal tissue is an indication of malignancy.

(iv) How meiosis plays its role in producing genetic variations?

Ans Crossing-over and random assortment of chromosomes are two significant happenings of meiosis. During crossing over, parental chromosomes exchange segments with each other which results in a large number of recombinations. At the same time during anaphase, the separation of homologous chromosomes is random, which gives very wide range of variety of gametes. Both these phenomena cause variations and modifications in the genome.

(v) Why cap and tail is added to eukaryotic RNA, when it leaves from nucleus to cytoplasm?

Ans Both ends of a pro-mRNA are modified by the addition of chemical groups. The group at the beginning (5′ end) is called a cap, while the group at the end (3′ end) is called the tail. The 5′ cap is added to the first nucleotide in the transcript (RNA) during transcription. The cap is modified guanine (G) nucleotide and it protects the transcript from being broken, helps the ribosome attach to the mRNA and start reading to make a protein.

(vi) Write two characteristics of DNA polymerase-III.

Ans One of the features of the DNA polymerase-III is that, it can add nucleotides only to chain of nucleotides that is already paired with the parent strands.

Another features of DNA polymerase-III is that, it can add nucleotides only to 3′ end of a DNA strand, This means that replication always proceeds 5′→3′ direction on a growing DNA strand. Because two parent strands of a DNA molecule are antiparallel, the new strands are oriented in opposite directions.

(vii) Define promoter. What is its role?

Ans Transcription is initiated when the enzyme RNA polymerase binds to a particular binding site called a promoter located at the beginning of the gene. In prokaryotes, within promoter, there are two binding sites TTGACA also called –35 sequence and TATAAT sequence also called –10 sequence, which have affinity for the RNA polymerase. In eukaryotes, these sites are at –75 and –25 sites, respectively.

(viii) What is membrane invagination hypothesis?

Ans The prokaryotic cell membrane invaginated (folded inward) to enclose copies of its genetic material. This invagination resulted in the formation of several double-membrane-bound entities (organelles) in a single cell. These entities could then have evolved into the eukaryotic mitochondrion, nucleus, chloroplast, etc.

(ix) Describe briefly; how molecular biology supports evolution?

Ans Evolutionary relationships among the species are reflected in their DNA and proteins. If two species have genes and proteins that match closely, the sequence must have been copied from a common ancestor e.g., common genetic code

brings evidence that all life is related. Molecular biology has thus provided strong evidence in support of evolution as the basis for the unity and diversity of life.

SECTION-II

NOTE: Attempt any Three (3) questions.

Q.5.(a) Describe the excretion in cockroach. Also draw labeled diagram. (3,1)

Ans **Excretion in Cockroach:**

Terrestrial arthropods, particularly in the insects, the excretory structures are adapted to collect excretory products from haemolymph in sinuses through suspended tubular structures called malpighian tubules. These malpighian tubules remove nitrogenous waste from the haemolymph. These are the only excretory structures in animal kingdom which are associated with digestive tract. The epithelial lining of the tubules transports solutes including salts and nitrogenous waste from haemolymph into tubules lumen. Fluid then passes to hind gut into the rectum. Rectum reabsorbs most of the salts and water, thus nitrogenous wastes are excreted as solid excreta, in the form of uric acid crystal along the faeces. This kind of adaptation in excretion is the success of these animals on land with acute shortage of water.

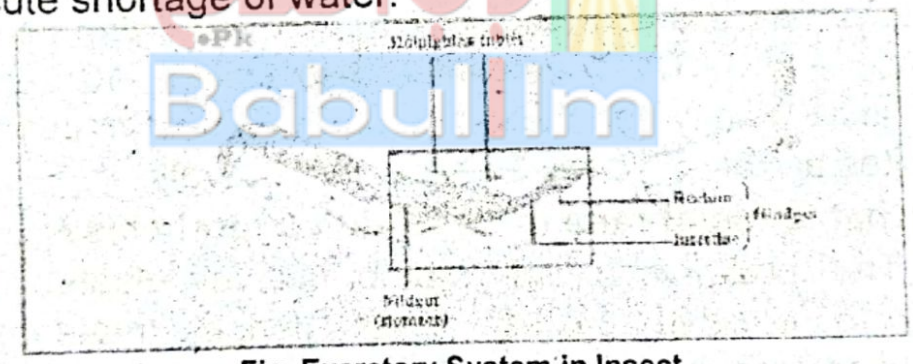


Fig. Excretory System in Insect.

(b) How the flow of energy in food chain of an ecosystem takes place? (4)

Ans **Energy:**

It can be defined as capacity to do work.

Radiant Heat and Light:

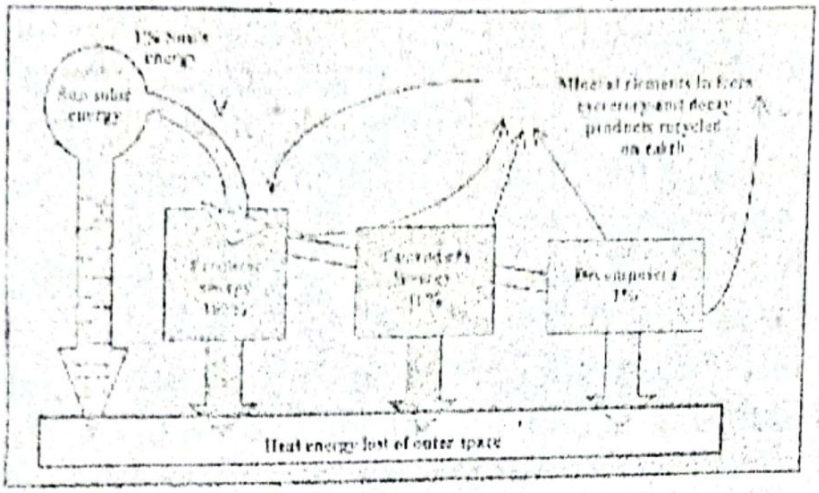
Energy in the form of radiant heat and light from the sun flows through an ecosystem passing through the different trophic levels (links) and radiates again back into outer space.

Gross Primary Production:

The total amount of energy fixed by plants is gross primary production.

Net Primary Production:

The amount of energy left after plants have met their respiratory needs is net primary production, which shows up as plant biomass.



Pattern of Flow of Energy:

(i) The pattern of eating and being eaten forms a linear chain called food chain which can always be traced back to the producers.

(ii) About 1% of the total energy from the sun is trapped by the producers in an ecosystem.

(iii) The remaining 99% of solar energy is used to evaporate water, heat up soil and is then lost to the outer space.

(iv) As energy is transferred from one trophic level to the next, from producer to primary consumer, between 80% to 90% of the original energy is heat as a byproduct of respiration.

(v) However, a continuous flux of energy from the sun prevents ecosystem from running down.

Pyramid of Energy:

(i) A pyramid of energy can be constructed showing energy transfer in a community of organisms.

(ii) A short food chain of two or three links supports a community more efficiently than a long chain of five links where much of the original energy from the producers would never reach these organisms at higher trophic levels.

Decomposers:

Decomposers are able to obtain energy by converting plant and animal tissues and waste into inorganic mineral ions.

Q.6.(a) Explain sliding filament model. How the bridges are controlled? (2,2)

Ans **Sliding Filament Model:**

When muscle fibre contracts, the thin and thick filaments undergo shifting. The I-band reduces in length and Z-line gets closer. H. Huxley and A.F. Huxley and their colleagues suggested a hypothesis in 1954 to explain all events in muscle contraction. This is called "Sliding filament model" of muscle contraction.

According to this theory, the thin filaments slide past the thick one's so that actin and myosin filaments overlap to greater degree. Thus the Z-line is brought close together, I-band shortens, the H zone disappears.

In this process of contraction, the cross bridges of thick filament become attached to binding sites on the actin filament. The cross bridges then contract to pull the actin filament towards the center of the sarcomere.

How the bridges are controlled:

When the muscle is at rest, the tropomyosin is disposed in such a way that it covers the sites on the actin chain where the head of myosin becomes attached. When the muscle is required to contract, calcium ions bind with the troponin molecule and cause them to move slightly. This has the effect of displacing the tropomyosin and exposing the binding sites for the myosin head. Once the myosin head has become attached to the actin filament, ATP is hydrolysed and the bridge goes to its cycle. This ATP is provided by the large number of mitochondria present in each muscle cell. From the above account, it is revealed that ATP is needed to break the link between the myosin bridge and the actin.

(b) Explain work of Beadle and Tatum on Neurospora with help of a figure. (2,2)

Ans Beadle and Tatum performed experiment on fungus, Neurospora. They exposed Neurospora spores to X-rays, expecting that DNA in some of these spores would experience damage in the regions encoding the ability to make compounds needed for normal growth.

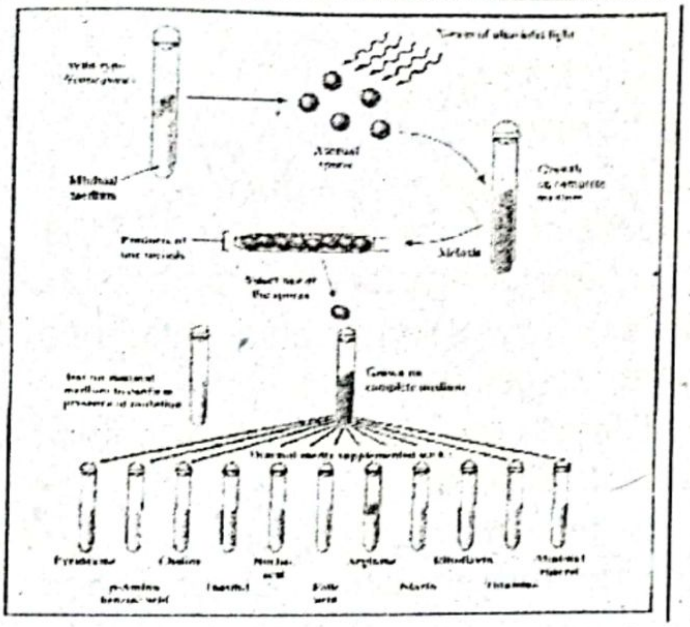


Fig. Beadle and Tatum's procedure for isolating nutritional mutants in Neurospora.

DNA changes of this kind are called mutations and the organisms that have undergone such changes are called mutants. Initially, they allowed the progeny of the irradiated spores to grow on a defined medium containing all of the nutrients necessary for growth, so that any growth deficient mutants resulting from the irradiation would be kept alive.

To determine whether any of the progeny of the irradiated spores had mutations causing metabolic deficiencies, they placed subcultures of individual fungal cells on a "minimal" medium that contained only sugar, ammonia, salts, a few vitamins and water. Cells that had lost the ability to make other compounds necessary for growth would not survive on such a medium. Using this approach, Beadle and Tatum succeeded in identifying and isolating many growth deficient mutants.

Q.7.(a) Explain the role of hormones produced by posterior lobe of pituitary gland. (4)

Ans The Pituitary Gland:

In man, pituitary gland or hypophysis cerebri is an ovoid structure about 0.5 gm in the adult. It is connected to brain through a short stalk. It has three lobes viz, anterior, median and posterior. The anterior lob is often referred to as the master gland, because in addition to producing primary hormones, it produces the tropic hormones, which control the secretion of hormones in many of the other endocrine glands.

Posterior Lobe:

Posterior lobe of the pituitary gland secretes the following hormones:

(i) Antidiuretic hormone:

- Its secretion is caused by decrease in blood pressure, blood volume and osmotic pressure of the blood which is detected by osmoreceptors in hypothalamus.
- External sensory stimuli also influence hypothalamic neurosecretory cells.
- Increased levels cause increased water reabsorption in distal parts of nephron.
- A lack of this hormone produces diabetes insipidus, characterized by production of large quantities of dilute urine and great thirst.

(ii) Oxytocin:

- Its secretion is stimulated by distension of cervix, decrease in progesterone level in blood, and neural stimuli during parturition and suckling.
- Its primary action is on smooth muscles, particularly in the uterus during childbirth.
- It also causes milk ejection from mammary glands.

(b) Describe importance of forests. (4)

Ans Forests are very important component of human environment.

- They provide protection to man and other organisms.
- Fruits of forest trees are the source of food for a number of animals.
- Forests regulate the flow of water in the streams, prevent soil erosion and make the environment very pleasant.
- Forests provide us Timber, fire wood, medicine, and many other products.
- Regions with high rainfall are suitable for tree growth. Trees are called environmental buffers.
- Removal of forests allows soil erosion, silting up of lakes and rivers and dams, heavy floods and the loss forever of thousands of species of animals and plants.
- The disastrous floods in India and Bangladesh in recent years may be attributed to deforestation.

Q.8.(a) Describe male reproductive system in man. (4)

Ans **Male Reproductive System of Man:**

It consists of following parts:

(i) External genitalia

(ii) Duct system

(i) External genitalia:

They consist of a pair of male gonads (testes) which lie outside the body, in the sac-like scrotum and male reproductive organ (penis) which is used to transfer the sperms into the female reproductive tract.

(ii) Duct system:

- Each testis consists of a highly complex duct system called seminiferous tubules in which repeated cell division by the cells of the germinal epithelium produce spermatogonia.
- These increase in size and differentiate into primary spermatocytes which undergo meiotic division to form secondary spermatocytes and spermatids.
- Eventually, the spermatids differentiate into mature sperms.
- Fluid secreted by sertoli cells provides liquid medium, protection and nourishment to sperms while they are in the tubules.
- The sperms are then transferred to the main duct of the male reproductive tract, the vas deferens, which forms highly convoluted epididymis.

The sperms then pass through the urinogenital duct and are discharged out.

Between the seminiferous tubules are interstitial cells which secrete testesterone. This hormone is essential for the successful production of sperms and also controls the development of male secondary sexual characteristics during puberty.

(b) Explain the phenomenon of sex determination in humans. (4)

Ans For Answer see Paper 2018 (Group-II), Q.8.(b).

Q.9.(a) Explain Darwin theory of natural selection. (4)

Ans Main points of theory of natural selection are given below:

(i) Descent with modification

(ii) Natural selection and adaptation

(i) Descent with modification:

- He believed in perceived unity in life, with all organism related through descent from some common ancestor that lived in the remote past.
- According to Darwin, the history of life is like a tree, with multiple branching and rebranching from a common trunk all the way to the tips of the living twigs, symbolic of the current diversity of organisms.
- At each fork of the evolutionary tree is an ancestor common to all lines of evolution branching from that fork.

(ii) Natural Selection and Adaptation:

- He suggested that populations of individual species become better adapted to their local environments through natural selection. Darwin's theory of natural selection was based on following observations:

(a) Overproduction:

- There is production of more individuals than the environment can support.
- This leads to a struggle for existence among individuals of a population.
- Only a fraction of offspring survive each generation.

(b) Struggle for existence:

- The individuals of population compete with each other which Darwin called struggle for existence.

(c) Survival of the fittest:

- Survival in the struggle for existence is not random, but depends in part on the hereditary constitution of the surviving individuals.
- Those individuals whose inherited characteristics fit them best to their environment are likely to leave more offspring than the less fit individuals.

(d) Evolution of New Species:

- This unequal ability of individuals to survive and reproduce will lead to a gradual change in population.
- The favourable characteristics pass to next generation.
- This ultimately leads to the evolution of new species.

(b) Write a note on regeneration. (4)

Ans The ability to regain or recover the lost or injured part of the body is called regeneration.

Regeneration in Different Animals:

Sponges:

- Due to simple organization, sponges possess great power of regeneration.
- These not only replace the parts lost during injury, but any piece of the body is capable of growing into a complete sponge.
- The process is, however, very slow and requires months or years for the complete development.

Lobster:

If lobster loses its pincer claw, a new claw regenerates.

Starfish:

If starfish breaks off portions of their arms into pieces till the central disc completely devoid of arm is left, the central disc in almost all cases and also the arms in some cases are capable of developing into separate individuals.

Earthworm:

If head of earthworm is removed, a new head regenerates.

Salamander:

Limb regeneration has been studied mostly in Salamanders of various ages.

Other Amphibians and Lizards:

(i) In these forms, the limbs are rapidly regenerated throughout life, more rapidly when the amphibian is young and small.

(ii) Besides limb, other parts of the body also have considerable regeneration capacity *e.g.*, tail in the larva of amphibians and in lizards.

(iii) For example, lizard can easily discard its tail but tail can be regenerated by special features of its tail.