

## Inter (Part-II) 2018

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

### SECTION-I

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

(i) Define anhydrobiosis.

**Ans** Terrestrial animals can tolerate dehydration and it differs in various animals. This characteristic is known as anhydrobiosis.

(ii) Differentiate between haemodialysis and peritoneal dialysis.

**Ans** Haemodialysis:

Haemodialysis means 'cleaning the blood'. In this procedure, blood is circulated through a machine which contains a dialyzer, called an artificial kidney. Dialyzer has two spaces separated by thin membrane. Blood passes from one side of the membrane and dialysis fluid on the other.

**Peritoneal dialysis:**

Peritoneal dialysis work on the same principle except that abdomen has a peritoneal cavity, lined by a thin epithelium called peritoneum. Peritoneal cavity is filled with dialysis fluid that enters the body through a catheter.

(iii) Define counter-current multiplier mechanism.

**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 called 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.

(iv) Define antagonistic movement of muscles.

**Ans** There are 650 muscles in human body, most of which occur in pairs. At joint, these muscles work against each other by contraction. This relationship is called antagonistic movement of muscles. The best example is the movement of elbow joint by biceps and triceps.



(v) Differentiate between ligament and tendon.

**Ans** Ligaments attach bone to bone and are slightly elastic while tendons attach muscles to bones and are non-elastic.

(vi) Compare hinge joint with ball and socket joint.

**Ans**

Hinge Joint	Ball & Socket Joint
1. The joint that allows the movements in two directions.	1. The joint that allows the movement in several directions.
2. At these joints, pair of muscles are arranged in the same plane as that of joint.	2. Such joints have at least two pairs of muscles present perpendicular to each other.
3. Elbow and knee joint are the examples of hinge joint.	3. Hip joint and shoulder joint are the examples of ball and socket joints.

(vii) What is vernalization?

**Ans** Biennial and perennial plants are stimulated to flower by exposure to low temperature. This is called vernalization.

(viii) What is apomixes?

**Ans** Apomixis is an asexual mode of seed formation that produces clonal progeny with a maternal genotype. It primarily influences reproductive events in the ovule of flower.

(ix) What is grazing? How grazers affect the texture of soil?

**Ans** Grazing is a method of feeding in which a herbivore feeds on plants such as grasses, or other multi-cellular organisms such as algae.

(x) Where the desert ecosystem are found in Pakistan?

**Ans** In Pakistan, the desert ecosystem located in western Punjab (Mianwali and Bukkar) where it is known as "Thal".

(xi) Name two pathogenic and two congenital diseases.

**Ans** Two congenital diseases:

(i) Hemophilia, (ii) Down's syndromes.

Two pathogenic diseases:

(i) Malaria, (ii) Smallpox.



(xii) Differentiate between renewable and non-renewable resources.

**Ans** **Renewable Resources:**

These are never depleted and are re-cycled in the nature. Air, water, food, land, forests and wildlife are renewable resources.

**Non-renewable Resources:**

These resources are exhaustible and once consumed cannot be replaced. These include various metals, non-metallic minerals and fossil fuels (coal, oil and natural gas).

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

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(i) What is chlorosis? How it is caused?

**Ans** Chlorosis is a deficiency disease in plants that lead to pale or yellow coloration of leaves due to the deficiency of certain elements such as low chlorophyll synthesis.

(ii) Differentiate between active and resting membrane potential.

**Ans** **Resting Membrane Potential:**

A typical neuron at rest is more positive electrically outside than inside the cell membrane. This net difference in charge between the inner and outer surface of a non-conducting neuron is called the resting membrane potential.

**Active Membrane Potential:**

After initiation of nerve impulse, there is a remarkable localized change in the resting membrane potential. It disappears for a brief instant and is replaced by a new potential called active membrane potential.

(iii) What is Parkinson's disease?

**Ans** It is a nervous disorder, characterized by involuntary tremors, diminished motor power and rigidity. The mental faculties are not affected. The disease is believed to be caused by cell death in a brain area that produces dopamine. Onset of disease is usually in 50's and 60's. The disease is slowly progressive, the patient may live for many years.

(iv) Define gene linkage and gene linkage groups.

**Ans** Gene linkage is a physical relationship between genes. A chromosome carries its linked gene en bloc in the form of a linkage group. Man has 23 linkage groups.



### **Linkage groups:**

The number of linkage groups corresponds to the number of homologous pairs of chromosomes. Man has 23 linkage groups. Genes for colour blindness, haemophilia, gout and hypophosphatemic rickets form one linkage group on human X-chromosome. Similarly, gene for sickle-cell anaemia and albinism make another linkage group on human chromosome 11.

**(v) What is heterogametic individual? Give example.**

**Ans** Man is heterogametic because it forms two types of sperms; half the sperms have X chromosomes while the other half are without any sex chromosome. A gamete without any sex chromosome is called nullo gamete.

**(vi) Give significance of test cross.**

**Ans** Mendel devised a cross called test cross which is used to test the genotype of an individual showing a dominant phenotype. It is a mating in which an individual showing a dominant phenotype is crossed with an individual showing its recessive phenotype. This cross finds out the homozygous or heterozygous nature of the genotype.

**(vii) What is gene pharming?**

**Ans** Gene pharming is a technology that scientists use to alter an animal's own DNA, or to splice in new DNA, called a transgene, from another species.

**(viii) What is palindromic sequence?**

**Ans** Bacteria produce a variety of such restriction enzymes, which cut the DNA at very specific sites characterized by specific sequence of four or six nucleotides arranged symmetrically in the reverse order. Such sequences are known as palindromic sequences.

**(ix) Define gene therapy. Name two main methods of gene therapy.**

**Ans** Gene therapy is the insertion of genetic material into human cells for the treatment of a disorder. It includes procedures that give a patient healthy genes to make up for faulty genes and also includes the use of genes to treat various other human illnesses such as cancer and cardiovascular diseases.



There are two main method used for gene therapy:

1. Ex-vivo gene therapy.
2. In-vivo gene therapy.

(x) Define synecology.

**Ans** The study of the relationship of different communities (grouping of population) to their environment is called synecology.

(xi) What are lichens?

**Ans** Lichens are dual organism composed of symbiotic association of algae living within a fungus mycelium. The lichens grow on exposed rock surfaces and are important colonizers of bare ground. The fungus gets food from alga, while alga might get protection by the fungus from intense sunlight and desiccation or the minerals absorbed by the fungus might be transferred to the alga.

(xii) Differentiate between primary and secondary succession.

**Ans** During primary succession, an ecosystem is forged from bare rock, sand or clear glacial pool where there is no trace of previous life. While, during secondary succession, a new ecosystem develops after an existing ecosystem is disturbed as in case of forced fire or an abandoned farm field.

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

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(i) Define teratology and teratogens.

**Ans** Teratology:

The scientific study of congenital abnormalities and abnormal formation is known as teratology.

**Teratogens:**

Any agent that can disturb the development of an embryo or fetus is called teratogen. Teratogen may cause a birth defect in the child.

(ii) What are intercalary meristems? Give their role.

**Ans** Intercalary meristems:

These are the parts of apical meristem which get separated from apex by permanent tissues. These are situated at the bases of internodes in many plants. These play important role in the production of leaves and flowers. These are of temporary nature.



(iii) **Differentiate between sense and anti-sense strands of DNA.**

**Ans** Transcription is the process in which an RNA copy of the DNA sequence encoding the gene is produced with the help of enzyme, RNA polymerase. Only one of the two strands of DNA are transcribed. This strand is called template strand or the antisense strand. The opposite strand is called coding strand or the sense strand.

(iv) **Define point mutations. Give one example.**

**Ans** Point mutations are mutational changes which affect the message itself, producing alterations in the sequence of DNA molecule. If alterations involve only one or a few base pairs in the coding sequence they are called **point mutations**.

**Examples of point mutations:**

Sickle cell anaemia and phenylketonuria are very well-known examples of point mutation.

(v) **Where codon and anticodon are situated?**

**Ans** Codon are found on messenger RNA, while anticodons (complementary of codons) are found on transfer RNA.

(vi) **How cytokinesis occur in plants?**

**Ans** During late telophase, the astral microtubules send signals to the equatorial region of the cell, where actin and myosin are activated which form contractile ring, followed by cleavage furrow, which depends towards the centre of the cell, dividing the parent cell into two daughter cells.

(vii) **Write a brief note on Turner's syndrome.**

**Ans** These individuals have one missing x chromosome with only 45 chromosomes (44 autosomes of x). Individuals with this condition often do not survive pregnancy and are aborted. Those who survive have female appearance with short stature, webbed neck, without ovaries and complete absence of germ cells.

(viii) **Define the term Neo-Darwinism.**

**Ans** Neo-Darwinism is known as modern synthesis. It is called a synthesis because it integrated discoveries and ideas from many different fields, including paleontology, taxonomy, biogeography, and, of course, population genetics.



(ix) What are endangered species? Give two examples from Pakistan.

**Ans** A species which is in imminent danger of extinction throughout its range.

In Pakistan, Indus dolphin, Blackbuck, Common leopard, Great Indian bustard, Houbara bustard, white-headed duck are among the animals near to extinction.

## SECTION-II

**NOTE: Attempt any Three (3) questions.**

**Q.5.(a) Discuss major homeostatic functions of the liver. (4)**

**Ans** For Answer see Paper 2017 (Group-I), Q.5.(a).

**(b) Define succession. Explain the different stage of xerosere. (4)**

**Ans** **Succession:**

Succession is a sequence of in the community structure of an ecosystem over a period of time. Community changes alter the ecosystem in ways that favours the competitors and species replace their predecessors in somewhat predictable manner until a stable, self-sustaining climax community is reached.

Xerosere has the following different stages:

**(i) Crustose lichen stage:**

A crust is any external protective surface and crustose means crusts on the substratum. Special types of lichens get impregnated in the form of crust. They can live in extreme conditions. Sometimes, their surface is wet due to rain and dewdrops. They absorb water during dry season. They are quiescent or dormant, normally desiccated during dry season.

**(ii) Foliage lichen stage:**

In this stage, the lichens are just like crumpled leaves attached at one point. It produces shade to the crustose lichens as a result of which their growth is reduced or decreased. The area becomes rough with more and more fissure and depressions develop. Common examples are, Dermatocarpon, Permellia, etc. At this stage, other plants invade called moss stage, because now soil is more porous with some litter of lichens.



**(iii) Moss stage:**

This is the third stage with mosses like, Polytrichum, Tortula, etc. They compete with lichens for water and penetrate much deeper into the soil as compared to the lichens, adding more humus to the soil.

**(iv) Herbaceous (plant) stage:**

Small seedling of herbaceous plants now establish due to the more availability of moisture, humus and soil for anchorage.

**(v) Shrub stage:**

Shrubby plants now start growing, dominating, shadowing herbaceous plants which die to add more humus to the soil.

**(vi) Climax forests:**

The soil is improved to an extent that it now allows the growth / establishment of woody plants. The shade of these plants inhibits the growth of most plants other than mosses, lichens, a few ferns, etc. Woody plants dominate and this stage in succession remains essentially the same if nothing changes in the environment to upset the balance. Because it is a stable stage in succession, the woody forest is considered to be the climax stage for this region.

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**Q.6.(a) What is the sliding filament model of muscle contraction? What does it explain? (4)**

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**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.



(b) What hypothesis did Beadle and Tatum test in their experiment on Neurospora? (4)

**Ans** Beadle and Tatum 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. 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, Beadle and Tatum 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.

Next the researchers added various chemicals to the minimal medium in an attempt to find one that would enable a given mutant strain to grow. This procedure allowed them to pinpoint the nature of the biochemical deficiency that strain had. The addition of arginine, for example, permitted several mutant strains, dubbed arg mutants, to grow. When their chromosomal positions were located, the arg mutations were found to cluster in three areas.

**Q.7.(a) Write any four differences between nervous and chemical coordination. (4)**

**Ans** **Nervous Coordination:**

This type of coordination involves specialised cells or neurons linked together directly or via the central nervous system, to form network that connects the cell or organs which receive stimuli (receptors) and those which carry out actions or responses (effectors). The neuron has the capacity to generate and conduct impulses which travel across the synapse and



pass from the receptors to the effectors, brings about nervous coordination.

### **Chemical Coordination:**

In animals, it involves endocrine system which comprises endocrine glands in various parts of the body, which secrete hormones. The endocrine or ductless glands are, with a few exceptions, discrete groups of cells, which make specific chemical compounds called hormones (Greek hormone is exciting, setting in motion). Endocrine system consists of some 20 endocrine glands / tissues lying in different parts of the body.

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**(b) Describe wild life as renewable resources. (4)**

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#### **Ans** **Wildlife:**

Wildlife refers to all non-cultivated plants and non-domesticated animals. Game animals and plants have been major source of food for humans. All living organisms are interdependent. 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 wild life 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 again is non-renewable resource. Water reserves where fishing is prohibited have also been set up to protect marine life. Rare species are sometime kept in zoo, where they can safely breed.

Wildlife plays very important role in food chain. Without these, the food chain can be disturbed to such an extent that it will be very difficult to maintain the balance. The effects of changes in the environment brought about by man are becoming more and more apparent with the passage of time. He must keep the wild life balance, otherwise, it may also jeopardize his own existence.

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**Q.8.(a) Write a note on tissue culture and cloning. (4)**

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#### **Ans** **Tissue culturing and cloning:**

In tissue culturing technique in plants, cambium tissue excised from plants can be stimulated by the addition of



nutrients, cytokinins and IAA. These cells show continued growth and differentiate into a new plant, genetically identical to their parents.

Tissue culture is now widely used for the rapid propagation of desired varieties or for varieties difficult to propagate by cuttings. Similar techniques have been developed for the tissue culture of animal cells.

Organism produced from a single cell by sub-culturing are called clones. In animals and especially among vertebrates, a nucleus from the somatic cell is removed and introduced into an egg cell, whose own nucleus has been destroyed by ultraviolet radiation. The egg with transplanted diploid somatic cell nucleus develops into an organism, genetically identical to the parent who has contributed the nucleus.

The cloning of desirable animals such as prize bulls, race horses, etc. might be as useful as cloning of useful varieties of plants.

However, the application of the technique to humans would be open to serious moral questions. Theoretically, any number of genetically identical copies of the same man or woman might be made.

The use of cloned cells allows the quantitative study of the action of hormones, drugs and antibodies to be made on cell. Such a technique is useful substitute for investigating the effect of drugs, cosmetics and pharmaceutical product on animal cells without exposing laboratory animal to these chemicals.

Cloning has the advantage that all the offspring behave similarly, but should an environmental hazard develop, non-resistant strains are present to lessen the impact. Also the degree to which environment influences clone development is not fully known and any cloned cell would have to go through all the phase of development once again including embryo, fetus, baby and childhood (in case of human being).

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**(b) Discuss sex-linkage in humans with one example. (4)**

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**Ans** ▶ **Sex-linkage in Humans:**

Humans have many X-linked traits of which some like haemophilia and colour blindness are recessive while others like hypophosphatemic or vitamin D resist rickets are dominant.



X-linked dominant is a trait which is determined by an X-linked dominant gene, while X-linked recessive is a trait that is determined by an X-linked recessive gene. Their patterns of inheritance are very different from each other.

### **X-linked recessive inheritance:**

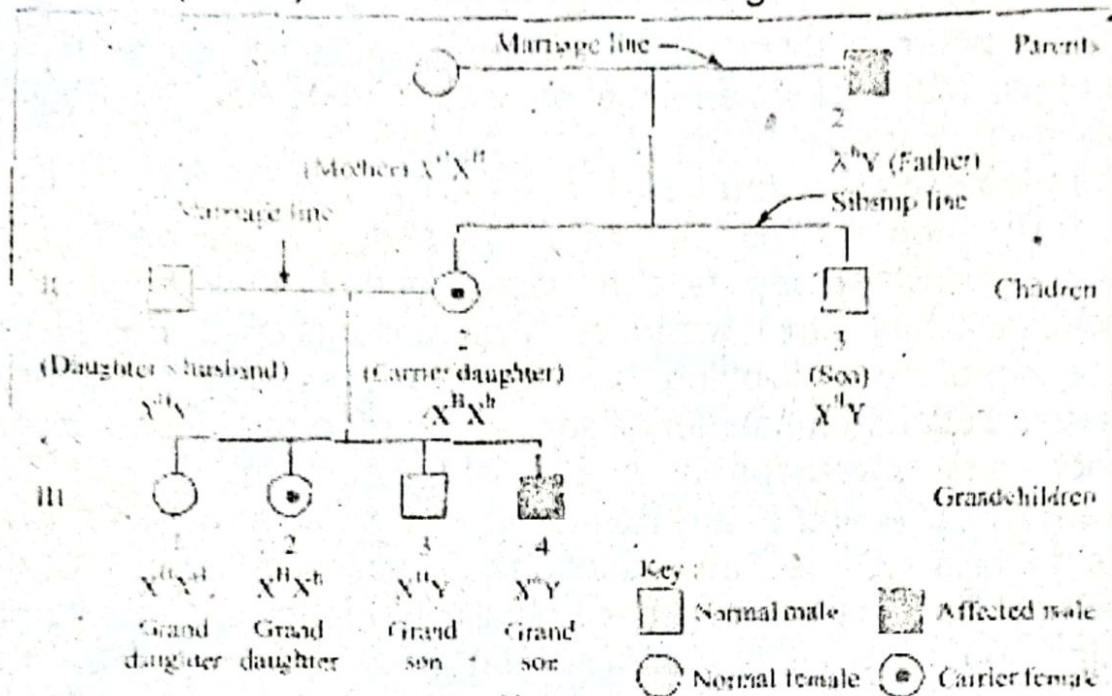
Experimental matings are not practically possible in humans. Mode of inheritance of human traits can be traced through pedigrees.

### **Genetics of Haemophilia:**

Haemophilia is a rare X-linked recessive trait. Haemophiliac's blood fails to clot properly after an injury, because it has either a reduction or malfunction or complete absence of blood clotting factors. It is a serious hereditary disease because a haemophiliac may bleed to death even from minor cuts. Haemophilia is of three types: A, B and C. Haemophilia A and B are non-allelic recessive sex-linked, but haemophilia C is an autosomal recessive trait. 80% haemophiliacs, suffer from haemophilia A due to abnormality of factor VIII, about 20% suffer from haemophilia B due to disturbance in factor IX, but less than 1% suffer from haemophilia C due to reduction in factor XI. Being X-linked recessives, haemophilia A and B affect men more than women, but haemophilia C affects both the sexes equally because it is autosomal. Chances for a man to be affected by haemophilia A and B are greater than a woman. A woman can suffer from haemophilia A or B only when she is homozygous for the recessive allele, but a man with just one recessive allele will display the trait. Haemophilia A and B zigzag from maternal grandfather through a carrier daughter to a grandson. It never passes direct from father to son. Gene for normal is H. Gene for haemophilia A is h. In generation I of this pedigree, a man (I – 2) suffering from haemophilia A marries a normal woman (I – 1). He passes haemophilia gene to his daughter (II – 2) through his X chromosome. He cannot pass this gene to his son (II – 3) because the son receives only Y chromosome from him. His daughter (II – 2) also receives another X but with normal dominant allele from her mother (I – 1). The daughter looks phenotypically normal, but she is heterozygous and a carrier for the recessive gene. When she marries a normal man (II – 1) she passes her father's trait to one of her two sons (III – 4) who



inherits grandfather's X from her. The single recessive allele for haemophilia expresses successfully in the hemizygous son because his Y chromosome does not carry its counterpart. The other son (III - 3) is normal as he inherits grandmother's X with



normal gene. One daughter (III - 1) with both normal X is normal, but the other daughter (III - 2) is carrier like her mother.

**Q.9.(a) What is aging? Describe its causes and symptoms.**

(4)

**Ans** "Aging":

Aging is an inevitable process and despite all the efforts to inhibit or stop it, aging process goes on. It can be defined as negative physiological change in our body. We identify the adult individual by the following sign of old age, all of them need not to be present e.g., loss of hair pigment, development of small pigmented area in the skin of face and arm, dryness and wrinkling of skin, loss of agility, increase weight due to fat, poor vision and forgetfulness, general vision and decreased body immunity. Degeneration of organ and tissues may also take place e.g., in joints, arthritis arises from the degeneration of cartilage, degeneration and disappearance of the elastic tissue in the tunica media of the blood vessel results in arteriosclerosis. Blood clotting in the coronary arteries may occur.

The exact process of aging is still unknown but the following points are worth consideration:



- (i) The cells of tissue have only a finite number of mitotic division and hence, the cells may have reached their finite number by the time a tissue or an organ is fully grown. For example, in the case of nervous system, mental activity and memory deteriorate and there are fewer nerve cells in old age.
- (ii) Change in intracellular substances take place during aging. For example, collagen acquires increased cross linkage in its protein molecule, while elastic tissue loses its elasticity with the passage of time. There is also hardening and loss of resilience in dense connective tissue and cartilage.
- (iii) Spontaneous mutation may result in loss of cells and degeneration of tissues. The process of aging can be slowed down by better nutrition and improved living conditions e.g., regular exercise, regular meal, adequate sleep, abstinence from smoking and maintaining ideal weight can prolong life by an average of 11 years.

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**(b) Describe the evidences of evolution by comparative anatomy. (4)**

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**Ans** **Comparative Anatomy:**

Anatomical similarities between species grouped in the same taxonomic category bring another support to the theory of the Descent with modification. For example, the same skeletal elements make up the forelimbs of human, cats, whales, bats, and all other mammals, although these appendages have very different functions. The basic similarity of these forelimbs is the consequence of the descent of all mammals from a common ancestor. The arms, wings, flippers, and forelegs of different mammals are variations on a common anatomical theme that has been modified for divergent functions. Similarity in characteristics resulting from common ancestry is known as homology, and such anatomical signs of evolution are called homologous structures.

Homologous organs are functionally different but structurally alike e.g., Fore limbs of man, bat, horse, whale, etc. are example of divergent evolution. Analogous organs are functionally alike but structurally different e.g., wings of bat, birds and insects etc. are examples of convergent evolution.



Comparative anatomy supports that evolution is a remodeling process in which ancestral structures that functioned in one capacity become modified as they take on new functions. The flower parts of a flowering plant are homologous. They are considered to have evolved from leaves, to form sepals, petals, stamens and carpels.

The oldest homologous structures are vestigial organs, rudimentary structures of marginal, if any, use to the organism. Vestigial organs are historical remnants of structures that had important functions in ancestors but are no longer essential presently. For instance, the skeletons of whales and some snakes retain vestiges of the pelvis and leg bones of walking ancestors, vermiform appendix in carnivores, ear muscles in man, etc.

