TEACHER'S CARE ACADEMY
KANCHIPURAM

ZOOLOGY

Unit - I

PG-TRB 2019 – 20

UNIT I

Binomial nomenclature (also called **binominal nomenclature** or **binary nomenclature**) is a formal system of naming species of living things by giving each a name composed of two parts, both of which use Latin grammatical forms, although they can be based on words from other languages. Such a name is called a **binomial name** (which may be shortened to just "binomial"), a **binomen** or a **scientific name**; more informally it is also called a **Latin name**. The first part of the name identifies the genus to which the species belongs; the second part identifies the species within the genus. For example, humans belong to the genus *Homo* and within this genus to the species *Homo sapiens*. The introduction of this system of naming species is credited to **Linnaeus**, effectively beginning with his work *Species Plantarum* in **1753**. The application of binomial nomenclature is now governed by various internationally agreed codes of rules, of which the two most important are the International Code of Zoological Nomenclature (**ICZN**) for animals and the International Code of Botanical Nomenclature (**ICBN**) for plants. Although the general principles underlying binomial nomenclature are common to these two codes, there are some differences, both in the terminology they use and in their precise rules. In scientific works, the "**authority**" for a binomial name is usually given, at least when it is first mentioned. Thus zoologists will give the name of a particular sea snail species as "*Patella vulgata* Linnaeus, 1758". The name "Linnaeus" tells the reader who it was that named the species; 1758 is the date of the publication in which the original description can be found, in this case the 10th edition of the book Systema Naturae.

Relationship to classification and taxonomy

Nomenclature (including binomial nomenclature) is not the same as classification, although the two are related. Classification is the ordering of items into groups based on similarities and/or differences; in biological classification, species are one of the kinds of item to be classified. In principle, the names given to species could be completely independent of their classification. This is not the case for binomial names, since the first part of a binomial is the name of the genus into which the species is placed. Above the rank of genus, binomial nomenclature and classification are partly independent; for example, a species retains its binomial name if it is moved from **one family to another or from one order to another**. The independence is only partial since the names of families and other higher taxa are usually based on genera. Taxonomy includes both nomenclature and classification. Its first stages (sometimes called "**alpha taxonomy**") are concerned with finding, describing and naming species of living or fossil organisms.

Binomial nomenclature is thus an important part of taxonomy as it is the system by which species are named. Taxonomists are also concerned with classification, including its principles, procedures and rules.

Writing binomial names

The binomial names of species are usually typeset in **italics**; for example, *Homo sapiens*. Generally the binomial should be printed in a font different from that used in the normal text; for example, "*Several more* Homo sapiens *fossils were discovered*." When handwritten, each part of a binomial name should be **underlined**; for example, *Homo sapiens*.

The first part of the binomial, the genus name, is always written with an initial capital letter. In current usage, the second part is never written with an initial capital. Older sources, particularly botanical works published before the 1950s, use a different convention. If the second part of the name is derived from a proper noun, e.g. the name of a person or place, a capital letter was used. Thus the modern form *Berberis darwinii* was written as *Berberis Darwinii*. A capital was also used when the name is formed by two nouns in apposition, e.g. *Panthera Leo* or *Centaurea Cyanus*.

When used with a common name, the scientific name often follows in parentheses, although this varies with publication. For example "The house sparrow (*Passer domesticus*) is decreasing in Europe." The binomial name should generally be written in full. The exception to this is when several species from the same genus are being listed or discussed in the same paper or report, or the same species is mentioned repeatedly; in which case the genus is written in full when it is first used, but may then be abbreviated to an initial (and a period/full stop). For example, a list of members of the genus *Canis* might be written as "*Canis lupus*, *C. aureus*, *C. simensis*". In rare cases, this abbreviated form has spread to more general use; for example, the bacterium *Escherichia coli* is often referred to as just *E. coli*, and *Tyrannosaurus rex* is perhaps even better known simply as *T. rex*, these two both often appearing in this form in popular writing even where the full genus name has not already been given.

All the animals of the biosphere are included in a large group called Animal Kingdom or Animalia. The animal kingdom is subdivided into two sub-kingdoms, namely Protozoa and Metazoa.

SUBKINGDOM 1. PROTOZOA:

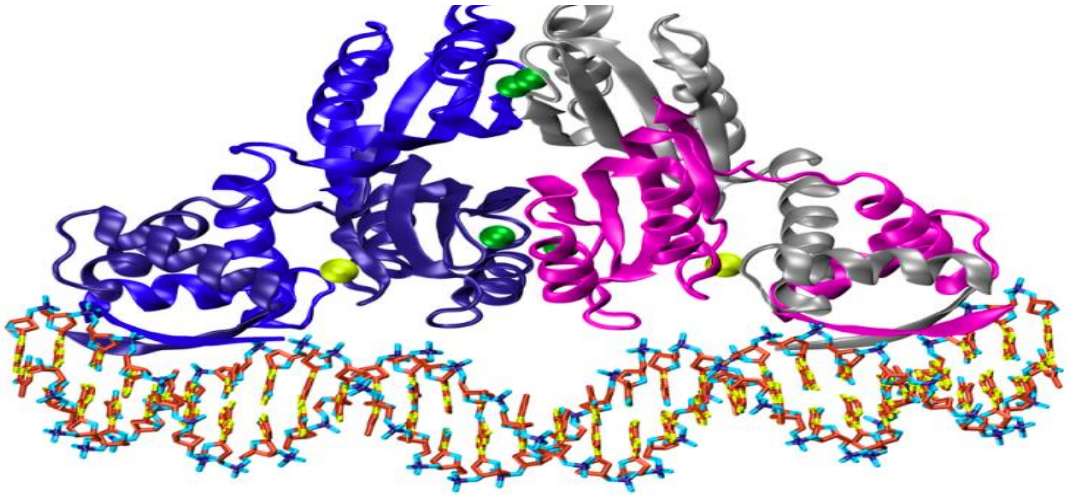
This sub kingdom includes microscopic, unicellular animals. It contains a single phylum called **Protozoa**. Eg. *Euglena*, *Amoeba*, *Paramecium*, etc.

TEACHER'S CARE ACADEMY

KANCHIPURAM

ZOOLOGY

Unit - II



COMPETITIVE EXAM

FOR

PG-TRB 2019 – 20

(Unit II)

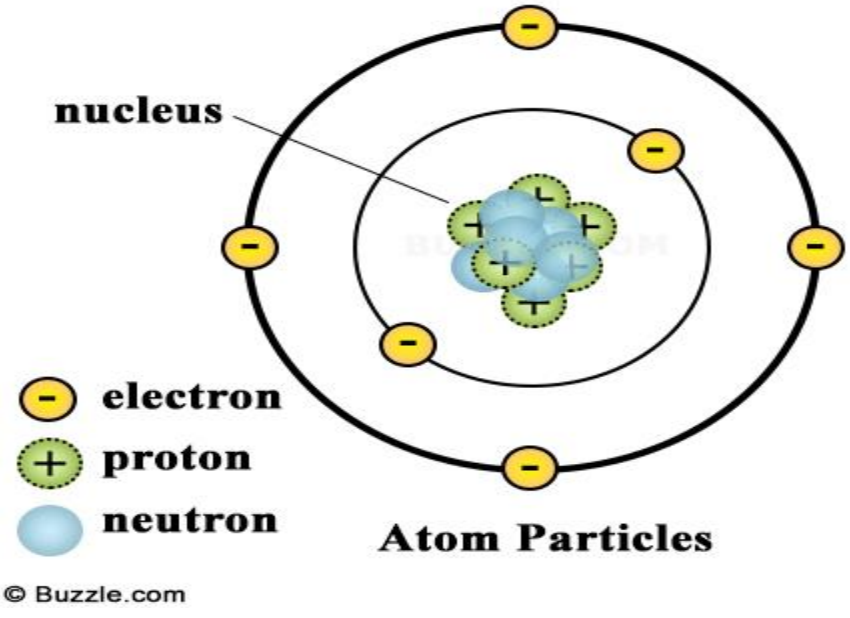
Biological chemistry:

- An atom is present at the most basic level in everything we see around us.
- In fact, every living organism is composed of atoms.
- Every non-living thing around you such as tables, chairs, water, etc is made up of matter.
- But the building blocks of matter are atoms.
- Therefore, living or non-living, everything is composed of atoms. Let us take a look at the structure of atom.

Atoms

- Atom is a Greek word which means "**indivisible**."
- The Greeks believed that matter can be broken down into very small invisible particles called atoms.
- Greek philosophers such as Democritus and John Dalton put forward the concept of the atom
- Atom is the smallest unit of matter that is composed of a *positively charged centre termed as "nucleus"* and the central nucleus is *surrounded by negatively charged electrons*. Even though an atom is the smallest unit of matter but it retains all the chemical properties of an element.

Structure of Atom



Structure of an atom can be basically divided into two parts:

1. an atomic nucleus
2. extra nucleus part

- The tiny atomic nucleus is the centre of an atom constituting positively charged particles **"protons"** and uncharged particles **"neutrons."**

- On the other hand, the extra nucleus part is a much larger region which is composed of a cloud of negatively charged particles called an **electron.**
- Electrons revolve around the orbit or centre of the nucleus. The attraction between the protons and electrons holds the structure of an atom together.
- Generally, all atoms are composed of these three subatomic particles except hydrogen. *Hydrogen is an exception to all atoms as it just contains one proton and one electron but lacks neutrons.*
- The number of protons indicates what element an atom is whereas the number of electrons indicates the type of reactions will happen in an atom.
- The atomic nucleus in the structure of the atom is composed of a fixed number of protons and the proton attracts the same number of electrons thereby making an atom electrically neutral.
- Ions are formed by addition or removal of electrons from an atom.

Atom valency:

Elements	Symbol	Atomic Number	No. of electron	Distribution of electron				Valency
				K	L	M	N	
Hydrogen	H	1	1	1				1
Helium	He	2	2	2				0
Lithium	Li	3	3	2	1			1
Beryllium	Be	4	4	2	2			2
Boron	B	5	5	2	3			3
Carbon	C	6	6	2	4			4
Nitrogen	N	7	7	2	5			3
Oxygen	O	8	8	2	6			2
Fluorine	F	9	9	2	7			1
Neon	Ne	10	10	2	8			0
Sodium	Na	11	11	2	8	1		1
Magnesium	Mg	12	12	2	8	2		2
Aluminium	Al	13	13	2	8	3		3
Silicon	Si	14	14	2	8	4		4
Phosphorous	P	15	15	2	8	5		3
Sulphur	S	16	16	2	8	6		2
Chlorine	Cl	17	17	2	8	7		1
Argon	Ar	18	18	2	8	8		0
Potassium	K	19	19	2	8	8	1	1
Calcium	Ca	20	20	2	8	8	2	2

- An element can lose or gain electron in order to complete the octet. This tendency of losing or gaining electrons imparts valency to an element.
- Let us take example of hydrogen. Hydrogen can readily lose or gain an electron. So, its valency is one. Now, let us take example of Hydrochloric Acid (HCl). One atom of chlorine combines with one atom of hydrogen to form hydrochloric acid.

TEACHER'S CARE ACADEMY

KANCHIPURAM

ZOOLOGY

Unit – III

PG-TRB 2019 – 20

(Unit III)

STATISTICS

Statistics is concerned with scientific methods for collecting, organising, summarising, presenting and analysing data as well as deriving valid conclusions and making reasonable decisions on the basis of this analysis. Statistics is concerned with the systematic collection of numerical data and its interpretation. The word 'statistic' is used to refer to

1. Numerical facts, such as the number of people living in particular area.

2. The study of ways of collecting, analysing and interpreting the facts.

Statistics may be defined as the science of collection, presentation analysis and interpretation of numerical data from the logical analysis. It is clear that the definition of statistics by Croxton and Cowden is the most scientific and realistic one. According to this definition there are four stages:

1. Collection of Data:

It is the first step and this is the foundation upon which the entire data set. Careful planning is essential before collecting the data. There are different methods of collection of data such as census, sampling, primary, secondary, etc., and the investigator should make use of correct method.

2. Presentation of data:

The mass data collected should be presented in a suitable, concise form for further analysis. The collected data may be presented in the form of tabular or diagrammatic or graphic form.

3. Analysis of data:

The data presented should be carefully analyses for making inference from the presented data such as measures of central tendencies, dispersion, correlation, regression etc.,

4. Interpretation of data:

The final step is drawing conclusion from the data collected. A valid conclusion must be drawn on the basis of analysis. A high degree of skill and experience is necessary for the interpretation.

COLLECTION OF DATA

Introduction

Everybody collects, interprets and uses information, much of it in numerical or statistical forms in day-to-day life. It is a common practice that people receive large quantities of information everyday through conversations, televisions, computers, the radios, newspapers, posters, notices and instructions. It is just because there is so much information available that people need to be able to absorb, select and reject it. In everyday life, in business and industry, certain statistical information is necessary and it is independent to know where to find it how to collect it. As consequences, everybody has to compare prices and quality before making any decision about what goods to buy. As employees of any firm, people want to compare their salaries and working conditions, promotion opportunities and so on. In time the firms on their part want to control costs and expand their profits. One of the main functions of statistics is to provide information which will help on making decisions. Statistics provides the type of information by providing a description of the present, a profile of the past and an estimate of the future. The following are some of the objectives of collecting statistical information.

1. To describe the methods of collecting primary statistical information.
2. To consider the status involved in carrying out a survey.
3. To analyse the process involved in observation and interpreting.
4. To define and describe sampling.

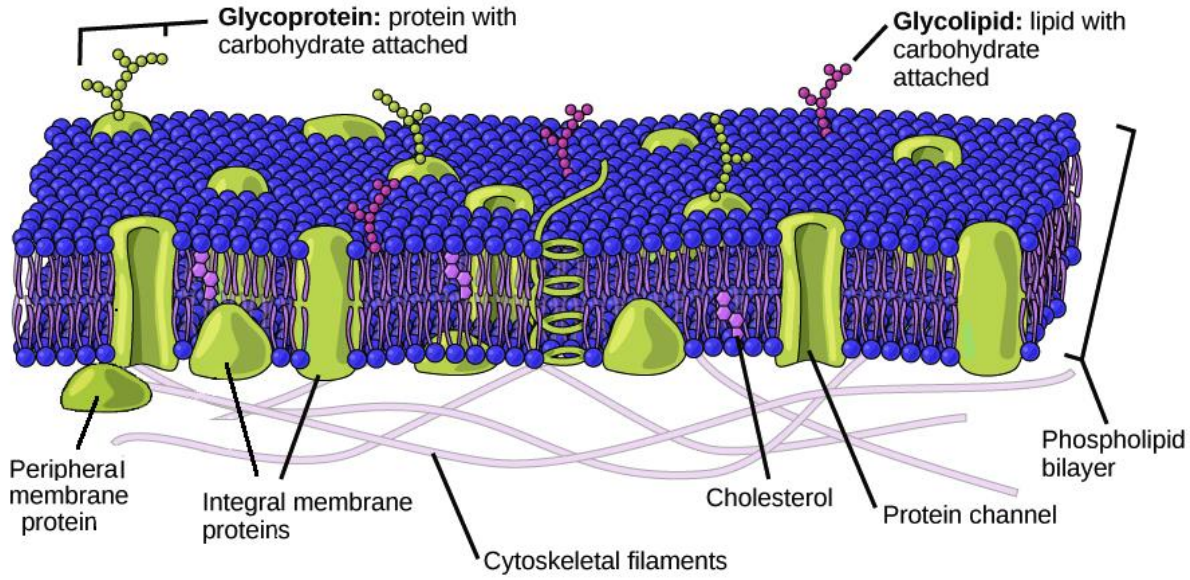
5. To analyse the basis of sampling. 6. To describe a variety of sampling methods. Statistical investigation is a comprehensive and requires systematic collection of data about some group of people or objects, describing and organizing the data, analyzing the data with the help of different statistical method, summarizing the analysis and using these results for making judgements, decisions and predictions. The validity and accuracy of final judgement is most crucial and depends heavily on how well the data was collected in the first place. The quality of data will greatly affect the conditions and hence at most importance must be given to this process and every possible precautions should be taken to ensure accuracy while collecting the data.

TEACHER'S CARE ACADEMY

KANCHIPURAM

ZOOLOGY

Unit - IV



COMPETITIVE EXAM

FOR

PG-TRB 2019 – 20

(Unit IV)

THE CELL:

- Robert Hooke was first to describe cell and he published his observation in his book micrographia (1670)
- He sliced a piece of cork and placed under his microscope. He observed honey comb like structural units and celled it as the 'cell'.
- Anton Van Leeuwenhoek (1674), studied the structure of bacteria, protozoa, etc. under the simple microscope which he himself designed
- All cells arise from pre existing cells by cell division (Rudolf Virchow, 1858)
- Robert Brown, a Scottish Botanist, discovered that all cells contain nucleus.
- Purkinje coined the term 'protoplasm' for the living substance present inside the cell.
- Cell theory was actually a generalization of observation made by made scientists around the world.
- Cell theory was proposed by Theoder Schwann, Mhleiden schleiden and Rudolf Virchow.
- The three tenets are

  All living organisms are composed of one or more cells
  (Schwann and Schleiden 1838-39)

  The cell is the basic structural and functional unit of life
  (Schwann and Schleiden 1838-39). Schleiden proposed that new cells especially from the nucleus. This was corrected by Rudolf Virchow, who proposed "**THEORY OF CELL LINEAGE**" stating that all cells arise from pre-existing cells

TYPES OF CELLS

i) Prokaryotic cells
ii) Eukaryotic cells

PROKARYOTIC CELLS:

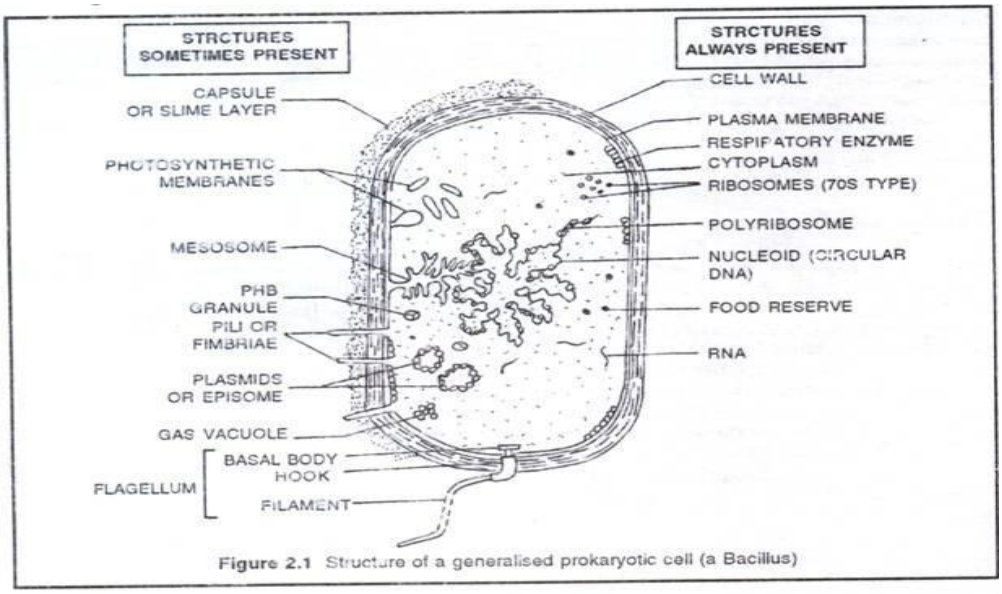
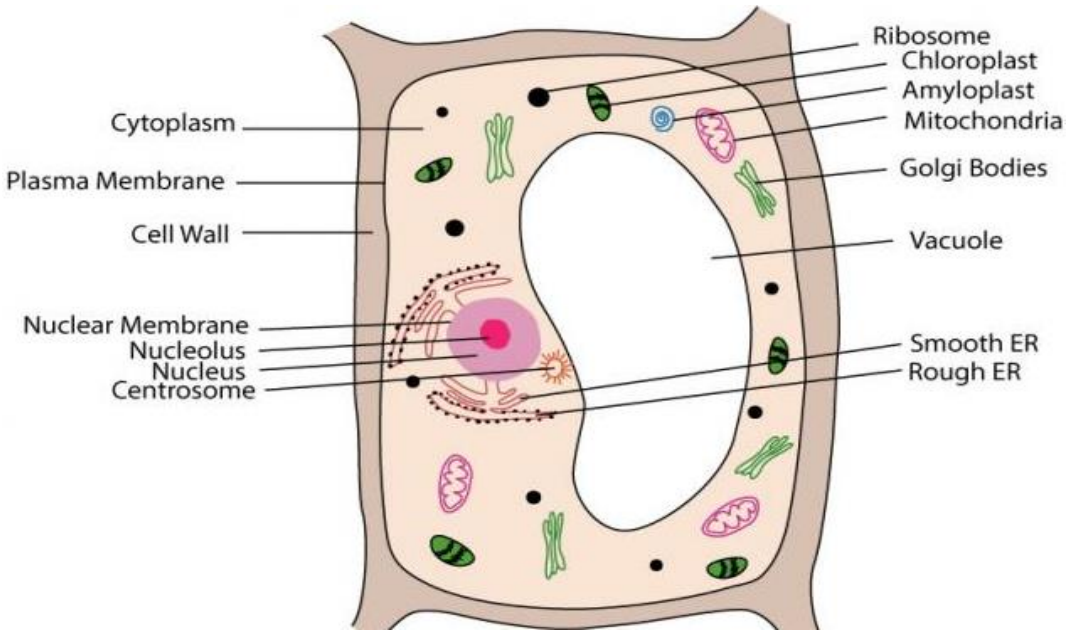


Figure 2.1 Structure of a generalised prokaryotic cell (a Bacillus)

- **Prokaryota**, in Greek means '**before nucleus'**.
- Prokaryotes are organisms that do **not have a well developed nucleus** or any other structure in their cell that are bound by a membrane.
- **Bacteria** and **bluegreen algae** are examples of **prokaryotes**.
- Their **genetic material** is in the form of a single **thread-like structure** that lies within the cell membrane.
- In prokaryotes the nuclear material is not surrounded by a nuclear membrane
- The prokaryotic cells are primitive cells. They are the ancestors for eukaryotic cells.
- Prokaryotic cells are smaller in size.
- The prokaryotic cells are surrounded by a plasma membrane like that of eukaryotic cells. The plasma membrame shows invaginations called mesosomes.
- In all prokaryotic cells the plasma membrane is surrounded by a cell wall. The cell wall is composed of amino sugars and muramic acid but not cellulose.
- The cell is filled with cytoplasm. The cytoplasm does not exhibit streaming.
- Prokaryotic cells contain ribosomes but they are smaller in size. They are 70s type.
- Centrioles or division centers absent from the prokaryotes
- The photosynthetic apparatus is in the form of flattened sacs called lamellae. They contain chlorophyll a in blue green algae and bacterio chlorophyll in bacteria
- Nucleolus absent from prokaryotic cells

EUKARYOTIC CELLS: (eu-true, karyote-nucleus)



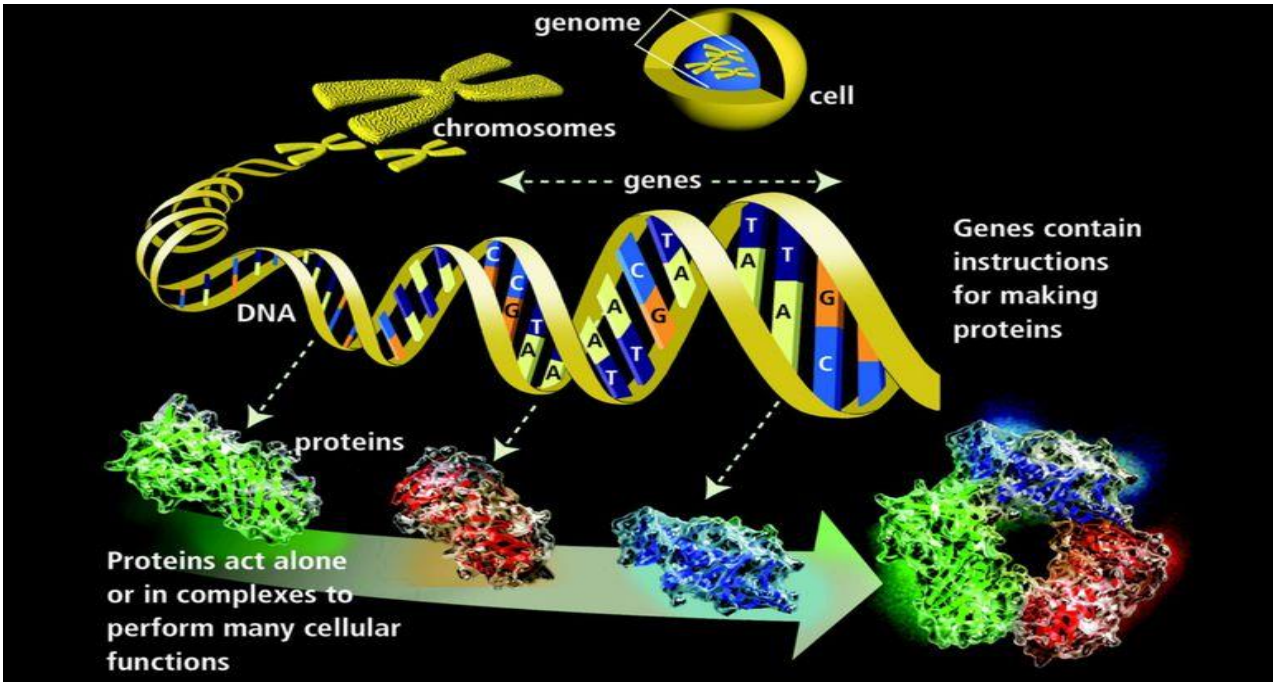
TEACHER'S CARE ACADEMY

KANCHIPURAM

ZOOLOGY

(UNIT - V)

GENETICS



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Unit 5 - GENETICS

GENE INTERACTIONS

When expression of one gene depends on the presence or absence of another gene in an individual, it is known as gene interaction. The interaction of genes at different loci that affect the same character is called epistasis.

The term epistasis was first used by Bateson in 1909 to describe two different genes which affect the same character, one of which masks the expression of other gene. The gene that masks another gene is called epistatic gene, and the gene whose expression is masked is termed as hypostatic gene. Epistasis is also referred to as inter-genic or inter-allelic gene interaction.

Characteristics of Gene Interaction:

The interaction of genes has several characteristics.

The important features of gene interaction are briefly described below:

i. Number of Genes: The epistatic gene interaction always involves two or more genes. This is an essential feature of gene interaction.

ii. Affect same Character: The epistatic genes always affect the expression of one and the same character of an individual.

iii. Expression: The phenotypic expression of one gene usually depends on the presence or absence of epistatic gene. The gene which has masking effect is called epistatic gene and the gene whose effect is masked is known as hypostatic gene.

Parents — Rose Comb RRpp × Pea Comb rrPP

F_1 — RrPp — Walnut Comb

F_2	RP	Rp	rP	rp
RP	RRPP [W]	RRPp [W]	RrPP [W]	RrPp [W]
Rp	RRPp [W]	RRpp [R]	RrPp [W]	Rrpp [R]
rP	RrPP [W]	RrPp [W]	rrPP [P]	rrPp [P]
rp	RrPp [W]	Rrpp [R]	rrPp [P]	rrpp [S]

W = Walnut, R = Rose, P = Pea, and S = Single comb

Fig. 8.1. Gene interaction for comb shape in poultry.

iv. Modification of Dihybrid Segregation Ratio: Epistasis leads to the modification of normal dihybrid or tri-hybrid segregation ratio in F_2 generation.

v. Genetic Control: Epistasis is usually governed by dominant gene, but now cases of recessive epistasis are also known.

Gene Interaction for Comb Shape in Poultry:

In gene interaction, sometimes two dominant genes controlling the same character produce a new phenotype in F_1 when they come together from two different parents. Such case of gene interaction was observed by Bateson and Punnett for comb shape in poultry.

There are three types of comb shape in poultry, viz., rose, pea and single. The comb shape is controlled by two pairs of alleles. The rose comb is governed by a dominant gene R and pea comb by a dominant gene P. The single comb is governed by two recessive genes (rrpp).

When a cross was made between rose (RRpp) and pea (rrPP), a new phenotype called walnut developed in F_1. The walnut comb developed as a consequence of combining two dominant alleles R and P together in F_1. Inter-mating of F_1 birds produced four types of combs, viz., walnut, rose pea and single in 9 : 3 : 3 : 1 ratio in F_2 generation.

Here individuals with R-P-(9/16) genotypes produce walnut comb, because two dominant genes together produce walnut comb. Individuals with R-pp (3/16) will give rise to rose comb, and those with rrP-(3/16) genotypes will produce pea comb. The single comb (1/16) will develop from a double recessive, genotype (Fig. 8.1).

MULTIPLE ALLELES

Multiple alleles in which three or more alternative forms of a gene (alleles) that can occupy the same locus. However, only two of the alleles can be present in a single organism. For example, the ABO system of blood groups is controlled by three alleles, only two of which are present in an individual.

ABO blood groups are controlled by the gene ***I***. The plasma membrane of the red blood cells has sugar polymers that protrude from its surface and the kind of sugar is controlled by the gene. The gene **(*I*)** has three alleles ***IA***, ***I B*** and ***i***. The alleles ***I A*** and ***IB*** produce a slightly different form of the sugar while allele i doesn't produce any sugar. Because humans are diploid organisms, each person possesses any two of the three ***I*** gene alleles. ***IA*** and ***IB*** are completely dominant over ***i***, in other words when ***IA*** and *i* are present only ***IA*** expresses (because *i* does not produce any sugar), and when ***IB*** and *i* are present ***IB*** expresses. But when ***IA*** and ***IB*** are present together they both express their own types of sugars: this is because of co-dominance. Hence red blood cells have both A and B types of sugars. Since there are three different alleles, there are six different combinations of these three alleles that are possible a total of six different genotypes of the human ABO blood types (Table).

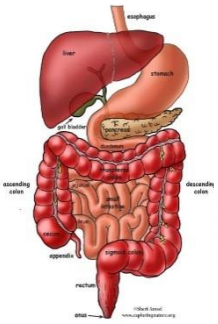
TEACHER'S CARE ACADEMY

KANCHIPURAM

ZOOLOGY

Unit – VI





(UNIT VI)

PHYSIOLOGY:

- Physiology is the study of functioning of organs and organ systems.
- All physiological activities are aimed at maintenance of **homeostasis, living** and **reproduction**.
- Homeostasis differentiates a living being from the non-living world. It provides the uniqueness for a self- duplicating, genomicized groups of organisms.
- **Homeostatic mechanisms** involve stabilizing an optimum level of water, minerals and other components of the
- body fluids and other thermal regulations.
- It is achieved by several bio-physical, bio-chemical processes, hormonal secretions and related metabolic modifications.

Nutrition

- The survival of all living organisms is due to several types of nutritive processes.
- The process of nutrition involves ingestion digestion, absorption and assimilation of food materials. The composition of nutrients vary in different types of feeding.
- However, for all living organisms, the nutrient comprises the following organic and inorganic components. They are carbohydrates, proteins, lipids, vitamins, minerals and water.
- Each component has a specific functional role.
- A well proportioned intake of nutrients depends on several factors such as stage of growth, sex ,health Condition, bodily activities and environmental situations.

Nutrients:

- Nutrients are molecules which the body uses to function appropriately and stay in a healthy condition.

Vitamins

- Vitamins are complex organic compounds, whose presence in trace amount in the food is essential for growth and other physiological activities.
- Vitamins do not have any energy value. However they are essential for controlling energy yielding processes.
- The identified vitamins are classified as **A**,**B**,**C**,**D**,**E** and **K**.

- Of these, vitamin **B** and **C** are water soluble in nature.Vegetables and fruits containing these vitamins if washed in water as cut pieces would loose them easily.
- Vitamin **A**,**D**,**E** and **K**, if consumed beyond required level may cause defects, commonly referred to as vitaminosis.
- Of the various vitamins, vitamin **D** or calciferol on exposure to sunlight can be synthesised by our body through the lipid compound called ergosterol, found below our skin. Hence it is known as 'sunshine vitamin'. The most important functions of vitamins include.

1. **Physiological processes:** Vitamin **A** plays a very important role in visual perception. Vitamin **E** might ensure fertility in animals. The clotting of blood is aided by vitamin K. Vitamin C provides immunity against infections and it may also support processes of growth.
2. **Maintenance of body tissues:** The epithelial tissues of the body are maintained by vitamin A and B2. The growth of bones is ensured by vitamin D. Vitamin E plays a role in the rejuvenation of tissues. Nourishment to nerve cells is provided by vitamin B1. The process of maturation of erythrocytes is due to vitamin B12.
3. **Metabolic processes:** The process of calcium and phosphorus metabolism happens due to the presence of vitamin D. Vitamin E remains an antioxidant. Vitamin B1 remains as a co-enzyme in tissue metabolism and it is found useful in the process of oxidation of glucose in CNS. Vitamin B2 is essential for carbohydrate metabolism. Niacin (vitamin B) plays a role as a co-enzyme and is essential for oxidation-reduction reactions. Normal metabolism of amino acids and fat are due to vitamin B6. Biotin (vitamin B) serves as a co-enzyme and co-factor in oxidative metabolism. Vitamin C activates certain intra-cellular enzymes.

Fat soluble vitamins

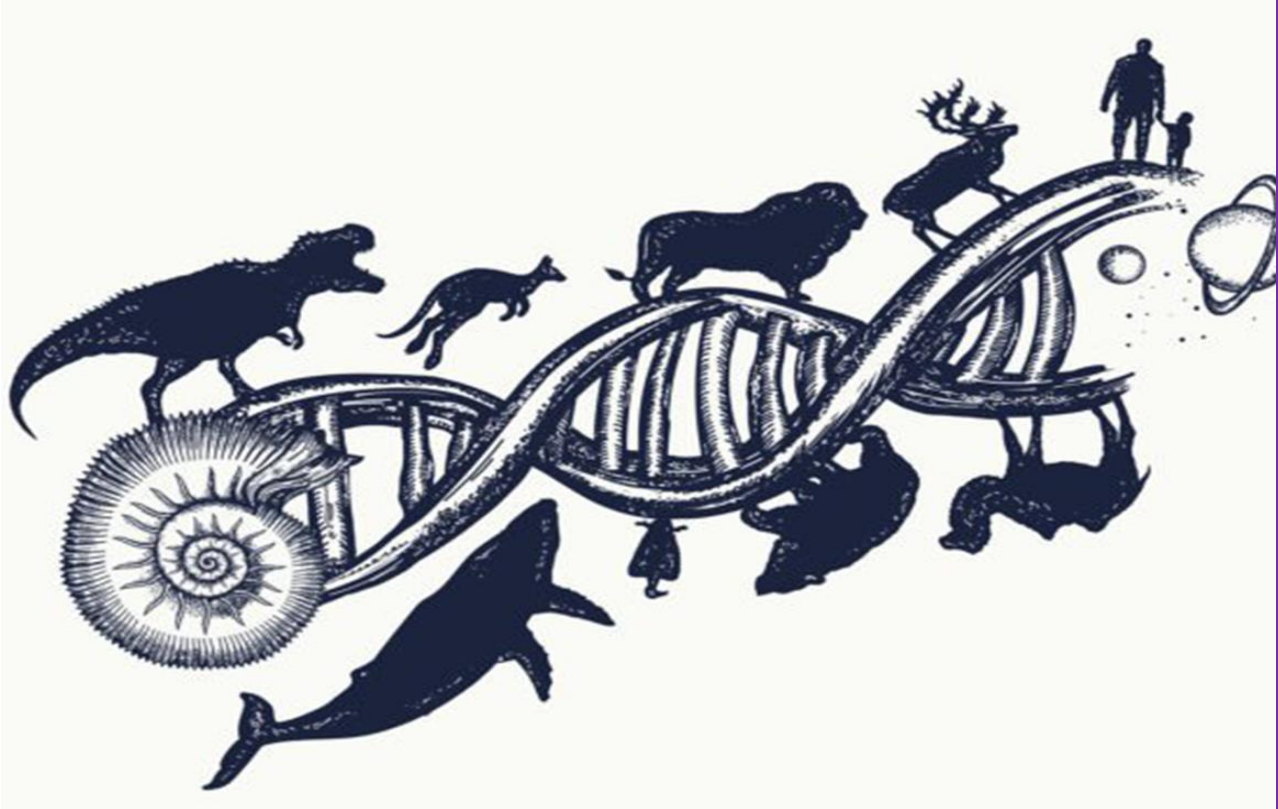
- The four vitamins, namely vitamin A, D, E, and K are known as fat or lipid soluble.
- Their availability in the diet absorption and transport are associated with fat.
- They are soluble in fats and oils and also the fat solvents (alcohol, acetone etc.).
- Fat soluble vitamins can be stored in liver and adipose tissue.
- They are not readily excreted in urine. Excess consumption of these
- A vitamin (particularly A and D) leads to their accumulation and toxic effects.

TEACHER'S CARE ACADEMY

KANCHIPURAM

ZOOLOGY

(UNIT –VII)



COMPETITIVE EXAM

FOR

PG TRB 2019-20

UNIT-VII

CHEMORECEPTION

Chemoreception, process by which organisms respond to chemical stimuli in their environments that depends primarily on the senses of taste and smell. Chemoreception relies on chemicals that act as signals to regulate cell function, without the chemical necessarily being taken into the cell for metabolic purposes. While many chemicals, such as hormones and neurotransmitters, occur within organisms and serve to regulate specific physiological activities, chemicals in the external environment are also perceived by and elicit responses from whole organisms. All animals and microorganisms such as bacteria exhibit this latter type of chemoreception, but the two commonly recognized chemosensory systems are the senses of taste, or gustation, and smell, or olfaction.

In terrestrial vertebrates, including humans, taste receptors are confined to the oral cavity. They are most abundant on the tongue but also occur on the palate and epiglottis and in the upper part of the esophagus. The taste receptor cells, with which incoming chemicals interact to produce electrical signals, occur in groups of 50–150. Each of these groups forms a taste bud. On the tongue, taste buds are grouped together into taste papillae. On average, the human tongue has 2,000–8,000 taste buds, implying that there are hundreds of thousands of receptor cells. However, the number of taste buds varies widely; some humans have only 500, whereas others have as many as 20,000. Healthy humans may have anywhere from three to several thousand taste buds per square centimeter on the tip of the tongue, and this variability contributes to differences in the taste sensations experienced by different people.

The taste buds are embedded in the epithelium of the tongue and make contact with the outside environment through a taste pore. Slender processes (microvilli) extend from the outer ends of the receptor cells through the taste pore, where the processes are covered by the mucus that lines the oral cavity. At their inner ends the taste receptor cells synapse, or connect, with afferent sensory neurons, nerve cells that conduct information to the brain. Each receptor cell synapses with several afferent sensory neurons, and each afferent neuron branches to several taste papillae, where each branch makes contact with many receptor cells. Unlike the olfactory system, in which input to the brain involves a single nerve, the afferent sensory neurons occur in three different nerves running to the brain—the facial nerve, the glossopharyngeal nerve, and the vagus nerve. Taste receptor cells of vertebrates are continually renewed throughout the life of the organism.

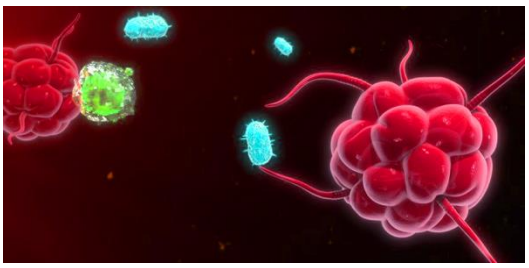
The taste receptor system of terrestrial vertebrates is concerned with the detection of chemicals that are taken into the oral cavity and are present at relatively high concentrations. In humans, five different classes, or modalities, of taste are usually recognized: sweet, salt, sour, bitter, and umami. But this is an anthropocentric view of a system that has evolved to give animals information about the nutrient content and the potential dangers of the foods they eat. The major nutrient requirements of all animals are carbohydrates, which act principally as a source of energy. Many lipids can be synthesized from carbohydrates, and animals use proteins derived from carbohydrates to assemble their own body proteins. In general, animals are unable to taste proteins, but they do taste amino acids (from which proteins are made). Some of the amino acids taste sweet to humans, whereas others taste sour, and umami taste, which is meat like, is a response to glutamic acid and its derivatives, such as monosodium glutamate (MSG). Sweet taste comes mainly from sugars (carbohydrates), and bitter taste derives from potentially harmful chemicals present in food, especially plants, which produce thousands of chemicals that offer the plants some protection from herbivores. The constituents of inorganic salts, such as sodium chloride, potassium chloride, and calcium chloride, are essential nutrients, but the quantities required to fulfill animal nutrient requirements are relatively small. It is possible that the salt taste reflects an animal's need to avoid ingesting too much salt, which would increase the osmotic pressure in body tissues, producing adverse effects on cell metabolism. Animals experiencing a salt deficit actively seek out and eat sodium chloride, but the sensory basis for this salt appetite is not understood. Minor essential nutrients, such as sterols and vitamins, are not known to be tasted by animals. They are probably of such widespread occurrence that an animal's normal food contains sufficient quantities, which is true for inorganic salts. However, associative learning may also have an important role in ensuring that appropriate levels of these compounds are obtained (*see below* Behaviour and chemoreception: Associative learning). Except for bitter-tasting substances, the chemicals that stimulate taste receptors are generally water soluble.

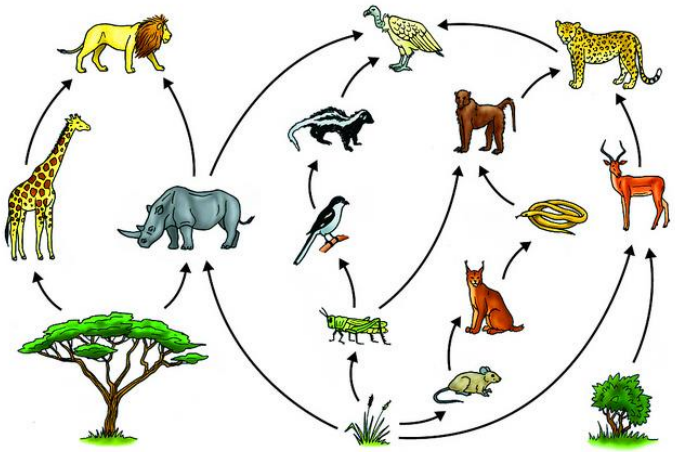
Mechanoreceptors

There are three classes of mechanoreceptors: tactile, proprioceptors, and baroreceptors. Mechanoreceptors sense stimuli due to physical deformation of their plasma membranes. They contain mechanically-gated ion channels whose gates open or close in response to pressure, touch, stretching, and sound. There are four primary tactile mechanoreceptors in human skin: Merkel's disks, Meissner's corpuscles, Ruffini endings, and Pacinian corpuscle; two are located toward the surface of the skin and two are located deeper. A fifth type of mechanoreceptor, Krause end bulbs, are found only in specialized regions.

TEACHER'S CARE ACADEMY
KANCHIPURAM

ZOOLOGY
Unit – VIII





COMPETITIVE EXAM
FOR
PG-TRB 2019 – 20

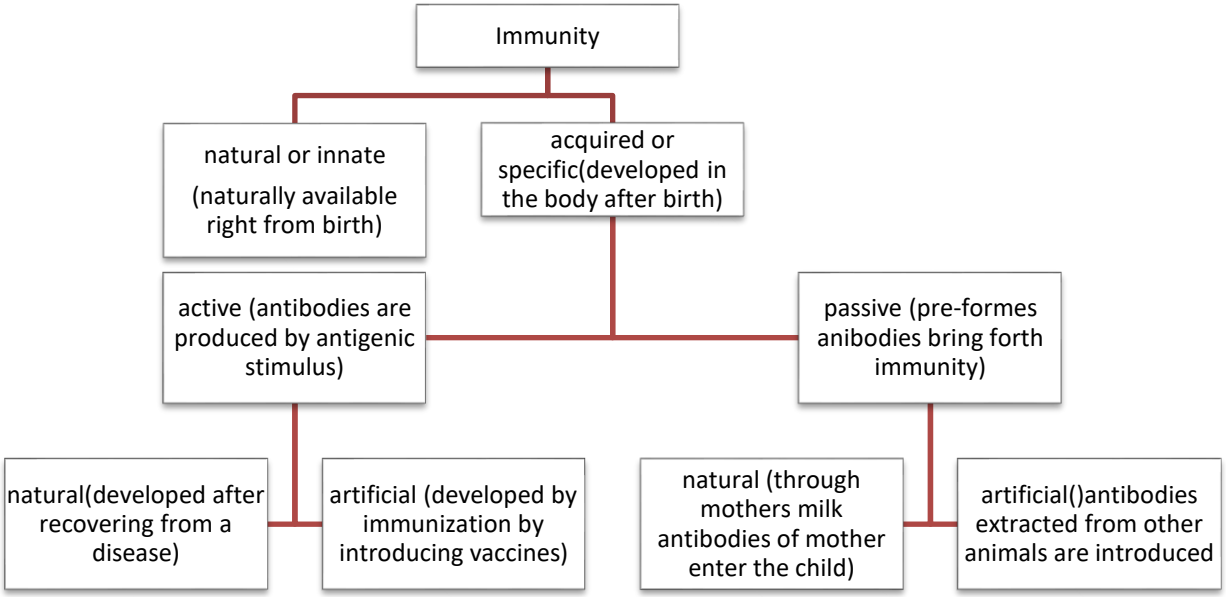
(Unit VIII)

IMMUNOLOGY

- The system of animal body, which protects it from various infectious agents and cancer, is called **Immune system**.
- Immunology is the study of immune system.
- The Latin term "**Immunis**", meaning "**exempt**" or "**freedom**", gave rise to the English word **immunity**.
- **Immunity definition**: The overall ability of body to fight against the disease causing pathogen is called immunity or disease resistance
- The lack of immunity is known as susceptibility
- Immunity is highly specific
- Any substance capable of eliciting immune response is called an ANTIGEN (ANTI body Generator)
- Foreign Particles that enter the body are called antigen.

CLASSIFICATION OF IMMUNITY

- **INNATE IMMUNITY (NONSPECIFIC OR NATURAL)**
- **ACQUIRED IMMUNITY (ADAPTIVE)**



INNATE IMMUNITY:

- **Non specific immunity, present from birth**
- The pathogens that enter into the body, are quickly killed by some components of the immune system.
- This is the **first line of defence** in most animals.
- It protects the body against any foreign invaders and does not show any specificity.
- Innate immunity consists of four types of barriers.

TYPES OF INNATE IMMUNITY	MECHANISM
1.Anatomical or physical barriers	
Skin	Prevents the entry of microbes. Its acidic environment (pH 3-5) retards the growth of microbes.
Mucus membrane	Mucus entraps foreign microorganisms and competes with microbes for attachment.
2.Physiological barriers	
Temperature	Normal body temperature inhibits the growth of pathogens. Fever also inhibits the growth of pathogens
Low Ph	Acidity of gastric secretions (HCl) kills most ingested microbes.
Chemical mediators	Lysozyme acts as antibacterial agent and cleaves the bacterial cell wall. Interferons induce antiviral state in the uninfected cells. Complementary substances produced from leucocytes lyse the pathogenic microbes or facilitate phagocytosis.
3.Phagocytotic barriers or cellular barriers	Specialized cells (monocytes, neutrophils, tissue macrophages)phagocyte and digest whole micro organisms
4.Inflammatory barriers	Tissue damage and infection induce leakage of vascular fluid, containing chemotactic signals like serotonin, histamine and prostaglandins. They influx the phagocytic cells into the affected area. This phenomenon is called diapedesis.

TEACHER'S CARE ACADEMY

KANCHIPURAM

ZOOLOGY

(UNIT - IX)

Zoogeography of Indian wild mammals

COMPETITIVE EXAM

FOR

PG TRB 2019-20

UNIT IX

Zoo-geography

Zoogeographyis the study of distribution of animals and plants on our planet, which occur in different regions of the world in a distinct pattern. The distribution of some animal species is so peculiar that it is difficult to explain their occurrence in a particular region. Zoogeography attempts to understand the complexities as well as the simplicity in the distribution of animals in the light of evolutionary and environmental influences.

India Wildlife Information

Wildlife Distribution in India

The presence or absence of an animal or plant in a certain region is determined by ecological and historical factors. Populations of organisms can become established in a region only if the range of conditions under which the species or individual can thrive (its ecological valence) is consistent with the sum of the conditions prevailing there. Animals and plants, then, are living indicators of the characteristics of their environment, their ranges mark the places in which environmental conditions are the same or similar.

To interpret the range of species properly, it is necessary to know in detail the conditions required for the species to live and thrive. The science of Zoo-geography has both ecological and historical aspects; the two are intimately interwoven, and each helps to elucidate the other. In the perspective of earth's history, the present position of India is of recent origin, and it forms a part of the Oriental region in the above - Zoo-geographic classification. Tens of millions of years ago, India was not even part of Asia. It was an island-continent, edging slowly northwards towards Asia across a vanished ocean which also isolated Africa from Eurasia.

The Himalaya Foothills

The Himalayan foothills are characterized by bhabar and tarai formations and the Siwalik ranges in the South. The bhabar tract consists of thick boulder deposits where the water table is very low. The conditions are relatively drier here. The tarai region consists of thick deposits of fine silt, the drainage is poor and the water table is high. The natural monsoon forest extends well into this region. The dominant species is sal. In its natural state, the tarai is characterized by tall grassy meadows with savannah vegetation.

This is one of the richest areas fro the typical big mammals of Northern India. The elephant, the similar, the swamp deer, cheetal, hog deer, barking deer, wild boar, all abound in this area.

This is also the famous tiger country immortalized by Jim Corbett. Panther and wild dogs are the co predators and the hyena, the jackal, the camp followers of the tiger, scavenging on the remains of the tiger kill. Both the black and the sloth bears are found in this area. Amongst the rodents, porcupine is the most prominent animal. The great India On horned rhinoceros, which once ranged all along the Himalayan foothills, is now confined to a few pockets in Assam and Nepal tarai ad is considered a rare species. **The High Altitude Region of Western Himalayas (Kashmir & Western Ladakh to Kumaon)**

This region consists of the belt of coniferous -pine forests occupying the altitudinal zone from 1500 mt, to nearly 2500 mt. the Rhododendron, dwarf hill bamboo and birch forests mixed with alpine pastures extend above the pine belt upto the snow line; the cold desert plateau of Ladakh exists in the extreme North West. These higher reaches above the coniferous - belt represent the alpine zone. The pine belt mostly acts as a transition zone for the rich fauna of the alpine zone in the higher altitudes. During winter, when the environment in the alpine zone becomes extremely cold, a number of species move down in this region. With the summer thaw, the alpine pastures again turn green and become the grazing grounds of most of these animals. One of the typical animals of the high altitude, cold desert regions of Ladakh and Tibet is the wild ass which is found in the paratactic deserts of Asia. Though identified as a rare and endangered species, it is still fairly common in Rupshu, Changthang and Chang Chenmo areas of Ladakh in the Indian region.

The bovid family is well represented in this park of the Himalaya, particularly in the higher altitudes. More species of wild goats and sheep live in this region than anywhere else. The largest bovid, the yak, has been domesticated for centuries by the people of Tibet and Ladakh but wild yak can still be found. They are black with long black horns and a little white on the muzzle.

Three species of wild goats occur in the Indian Himalaya. The highest coniferous forests are roamed by thar, a typical goat with rather abort horns set close together on top of the head. Thar are gregarious animals grazing in herds while sentinels mount a look out for possible danger. Even higher, on the finest of all goats with its long horns shaped like thick, heavy, cork screws. The fur of markhor is rich reddish brown turning to grey in winter. Like all wild goats, it is an amazingly agile climber. In winter, markhor retreats to tower slopes where forage is more plentiful. They even climb along the branches of evergreen oaks to browse its leaves. The third goat found in the Western Himalayas is the ibex. But unlike thar and markhor which are limited to the Himalaya, ibex has a much wider range, inhabiting mountainous regions all over Central Asia from the Himalaya to the Altai and extending westwards as far as Spain.

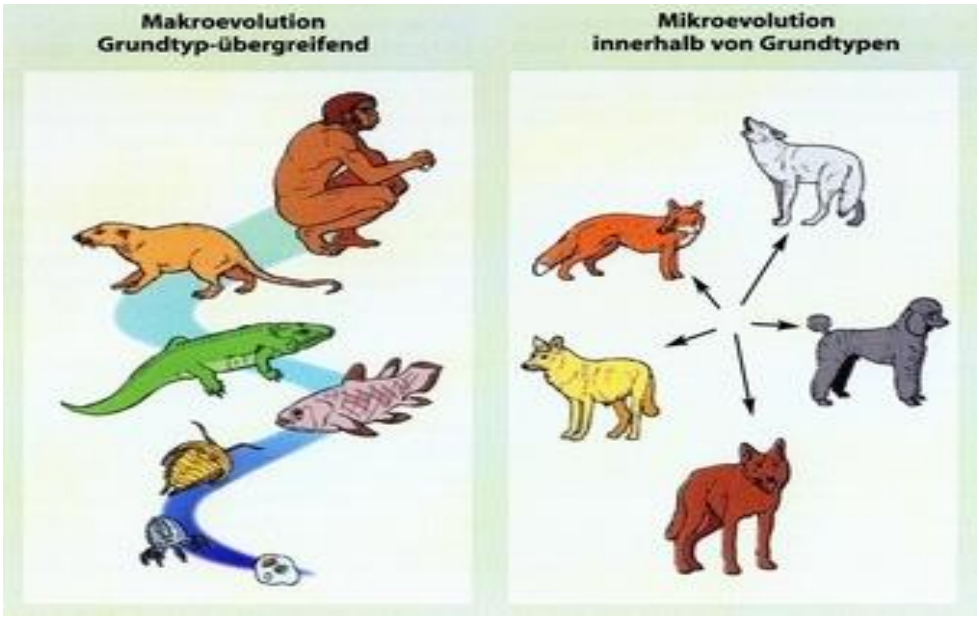
TEACHER'S CARE ACADEMY

KANCHIPURAM

ZOOLOGY

(UNIT - X)

Macro evolution



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UNIT X - MACRO EVOLUTION

What is macroevolution?

Macroevolution generally refers to evolution above the species level. So instead of focusing on an individual beetle species, a macroevolutionary lens might require that we zoom out on the tree of life, to assess the diversity of the entire beetle clade and its position on the tree.

Macroevolution encompasses the grandest trends and transformations in evolution, such as the origin of mammals and the radiation of flowering plants. Macroevolutionary patterns are generally what we see when we look at the large-scale history of life.

It is not necessarily easy to "see" macroevolutionary history; there are no firsthand accounts to be read. Instead, we reconstruct the history of life using all available evidence: geology, fossils, and living organisms.

Once we've figured out *what* evolutionary events have taken place, we try to figure out *how* they happened. Just as in microevolution, basic evolutionary mechanisms like mutation, migration, genetic drift, and natural selection are at work and can help explain many large-scale patterns in the history of life.

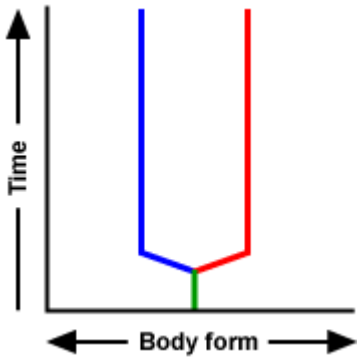
The basic evolutionary mechanisms — mutation, migration, genetic drift, and natural selection — can produce major evolutionary change if given enough time.

A process like mutation might seem too small-scale to influence a pattern as amazing as the beetle radiation, or as large as the difference between dogs and pine trees, but it's not. Life on Earth has been accumulating mutations and passing them through the filter of natural selection for 3.8 billion years — more than enough time for evolutionary processes to produce its grand history.

Patterns in macroevolution

You can think of patterns as "what happened when." All of the changes, diversifications, and extinctions that happened over the course of life's history are the patterns of macroevolution. However, beyond the details of individual past events — such as, when the beetle radiation began or what the first flowers looked like — biologists are interested in general patterns that recur across the tree of life:

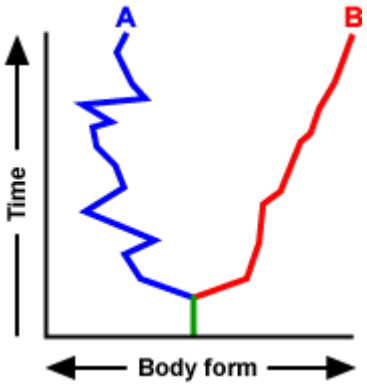
1. **Stasis:** Many lineages on the tree of life exhibit stasis, which just means that they don't change much for a long time, as shown in the figure to the right.



In fact, some lineages have changed so little for such a long time that they are often called living fossils. Coelacanths comprise a fish lineage that branched off of the tree near the base of the vertebrate clade. Until 1938, scientists thought that coelacanths went extinct 80 million years ago. But in 1938, scientists discovered a living coelacanth from a population in the Indian Ocean that looked very similar to its fossil ancestors. Hence, the coelacanth lineage exhibits about 80 million years' worth of morphological stasis.

A coelacanth swimming near Sulawesi, Indonesia

2. **Character change:** Lineages can change quickly or slowly. Character change can happen in a single direction, such as evolving additional segments, or it can reverse itself by gaining and then losing segments. Changes can occur within a single lineage or across several lineages. In the figure to the right, lineage A changes rapidly but in no particular direction. Lineage B shows slower, directional change.



Trilobites, animals in the same clade as modern insects and crustaceans, lived over 300 million years ago. As shown below, their fossil record clearly suggests that several lineages underwent similar increases in segment number over the course of millions of years.

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- Psychology
- General Knowledge
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