

# BIOLOGY

**Biology** – Branch of science in which living beings are studied.

- **Botany:** Study of different aspects of plants. *Theophrastus* is known as father of Botany.
- **Zoology:** Study of various aspects of animals. *Aristotle* is called father of Zoology as well as Biology.

## Important Terms of Biology :

Anatomy	Study of Internal structure of organism.
Apiculture	Rearing of honey bee for honey
Bacteriology	Study of bacteria
Cytology	Study of cell.
Cardiology	Study of heart
Demography	Study of population
Diffusion	Random movement of molecule/ ion or gases from a region of higher concentration to lower concentration.
Dermatology	Study of skin
Dendrochronology	Counting and analyzing annual growth rings of tree to know its age.
Eugenics	Study of factors connected with the improvement of human race.
Euphenics	Treatment of defective in heredity through genetics engineering.
Ethnology	Study of science dealing with different races of human.
Entomology	Study of insects.
Gerontology	Study of ageing
Gastroenterology	Study of alimentary canal or stomach and intestine related disorders.
Histology	Study of tissue organization and their internal structure with the help of microscope.
Hematology	Study of blood.
Hepatology	Study of liver.
Ichthyology	Study of fishes
Mammography	Branch of science which deal test for breast cancer.
Mycology	Study of fungi.
Nanotechnology	The study 'Science of small' is known as nanotechnology
Neonatology	Study of new born
Nephrology	Study of Kidneys
Osmosis	Movement of water molecule across semi permeable membrane from the region of its higher concentration to the region of lower concentration.
Odontology	Study of teeth and gum.
Osteology	Study of bones.
Oncology	Study of cancer and tumours.
Ornithology	Study of birds.
Ophthalmology	Study of eyes.
Paleontology	Study of fossils.
Physiology	Study of function of various system of organism.
Pathology	Study of diseases, effects, causable agents and transmission of pathogens.
Pomology	Study of fruit and fruit yielding plant.
Pisciculture	Rearing of fishes.
Paediatrics	Branch of medicine dealing with children.
Taxonomy	Study of classification, nomenclature and identification of organism
Trichology	Study of hair.

### Classification of Organism:

**Carl Linnaeus** divide all organism into two kingdoms – Plant and Animal kingdom. He laid the foundation of modern classification system and therefore he called as **father of taxonomy**.

**Binomial nomenclature:** There was the need of uniform international naming of organism. In biology every organism is given two proper names. The first name is genus name always started with capital letter and the second name is species started with small letter. For example scientific name of human is *Homo sapiens*. *Homo* is the name of genus, whose one species is *sapiens*

### Scientific Names of Some Organisms :

Man	<i>Homo sapiens</i>
Cat	<i>Felis domestica</i>
Mango	<i>Mangifera Indica</i>
Rice	<i>Oryza sativa</i>
Wheat	<i>Triticum aestivum</i>
Dog	<i>Canis familiaris</i>
Cow	<i>Bos indicus</i>
Housefly	<i>Musca domestica</i>
Rubber	<i>Hevea Brasiliensis</i>

### Study of Cell:

- Study of cell is called **cytology**.
- Cell is the basic structural and functional unit of life.
- The word cell was first coined by **Robert Hook**.
- The first person to see a cell under the microscope is **Robert Hook**.
- The concept that all plants are made of cells was put forward by –**M. J. Schleiden**.
- The smallest cell is ***Mycoplasma gallisepticum***.
- The largest human cell is ***Ovum (female egg)***.
- The smallest human cell is ***Sperm***.
- The longest cell in the human body is ***Neuron***.

### Structure of a Cell:

- **Cell wall:**
  - Cell wall is found only in plants.
  - It is a non living part of the cell and freely permeable.
  - It is made up of ***Cellulose*** or ***Chitan***.
- **Cell Membrane:**
  - It is the outer membrane of the cytoplasm found both in animals and plants.
  - Cell membrane is the outer covering in the case of animal cells while in the plant cell it is found within the cell wall.

### Protoplasm:

- The whole fluid present inside plasma membrane is protoplasm.
- Protoplasm is made up of various chemical substance like water, ions, salt and organic molecule.
- It is the living part of cell.
- Protoplasm is divided into two parts.
  - ***Cytoplasm***: The fluid found outside the nuclear membrane.
  - ***Nucleoplasm***: The fluid found inside the nuclear membrane.

### Mitochondria:

- These are cylindrical, rod shaped or spherical structure found in cytoplasm.
- It is known as the **power house** of the cell.

### Golgi bodies:

- Golgi bodies are made up of group of tubes, vesicles and vacuoles.
- In plant it is more in number and here it is known as dictyosomes.
- It is known as the **Traffic police** of the cell.

### Endoplasmic reticulum:

- Membranous network of tubes like structure found in cytoplasm is called endoplasmic reticulum.
- Endoplasmic reticulum helps in the distribution of material.
- It forms supporting framework of cell or act as the skeleton of the cell.

### Ribosome:

- Small granules like structure found attached to the **endoplasmic reticulum** are known as Ribosomes.
- It is made up of **RNA**.
- Ribosomes take part in **protein synthesis**.

### Lysosome:

- These are sac like structure bounded by single membrane.
- It helps in intracellular digestion.
- The enzyme found in lysosome may digest the entire cell. So it is also known as **suicidal bag**.

### Apoptosis:

- It is a process of programmed cell death that occurs in multi-cellular organisms.
- This occurs when the cell has fulfilled its biological functions.

### Plastid:

- Plastid is a double membrane found in plants & algae.
- Only found in plant cell.
- It is of three type: (a) Chloroplast (b) Chromoplast (c) Leucoplast.

#### Chloroplasts:

- These are green pigments found in green plants involved in photosynthesis and is known as '**Kitchen of the cell**'.
- Chloroplast provides green colour to plants & take part in photosynthesis.

#### Chromoplast:

- Provides various colours to the plants like flower, fruit etc.
- Chromoplast named **Lycopene** provides red colour to **tomato**.
- Chromoplast named **Carotene** gives orange colour to **Carrot**

#### Leucoplast:

- It is **colourless**. It stores the food in the form of starch, fat & protein.
- Leucoplast is found in **root** and underground stem.

### Nucleus:

- The nucleus is a spherical, centrally located major structure found in the cell.
- It is also known as the **brain of the cell**.
- Chromosomes are the thread like substances found in the nucleus.
- Chromosomes are made up of **DNA** & Histone proteins.
- Different animals have different number of chromosomes.
- The total number of chromosomes in humans is **46** or **23 pairs**.
- Chromosomes, other than the sex chromosomes are called **autosomes**.
- Number of autosomes in a human cell is 44 (22 pairs) and number of sex chromosomes is 2 (1 pair)

### DNA:

- DNA is a nucleic acid found in the nucleus of the cell.
- It is found in cell of every living organism.
- The structure of DNA is **double helix**.
- It was propounded by **Watson** and **Crick**.

- DNA contains genetic information in coded form and it carries genetic information from generation to generation.

#### RNA:

- RNA is found in the **cytoplasm** of the cell.
- The main function of RNA is **protein synthesis**.

#### Genetics:

- Transmission of character from one generation to next generation is called heredity.
- The process of transfer of hereditary character from generation to generation is called genetics.
- **Gregar Johan Mendal** was the first who gave the idea of heredity based on his experiment in 1822- 1884. He is also known as **father of genetics**.

#### Term related to genetics:

- **Linkage:** Linkage is an exception of Mendel law. When two different gene are present on the same chromosome they express themselves together instead of independently. This phenomenon is known as Linkage.
- **Mutation:** A sudden change in the gene which is heritable form one generation to other. The term Mutation was first coined by **Hugo De Vries**.

#### Cloning:

- It is a process of producing many identical organism from a single cell having same genetic character as his mother. **Ian Wilmut** is the father of cloning and the first animal created through cloning is a sheep named Dolly. '**Garima**' a buffalo Calf is India's first cloned animal.

#### Genetically modified organism (GMO):

- Manipulation of gene by cutting or joining the segment of DNA to get desired varieties of organism is called genetically modified organism. This is also known as genetic engineering.

#### Down's Syndrome (Mongolism):

- A congenital abnormality in human beings due to the trisomy of chromosome **21** (chromosome 21 occurs in triplicate rather than in duplicate). The affected individuals, therefore, carry **47** chromosomes and are greatly retarded physically and mentally. They are usually short-statured with a broad skull and a round face having a much higher frequency of congenital heart defects.

#### Sickle Cell Anaemia:

- In this disorder **erythrocytes** (Red blood Cells) get destroyed more rapidly than normal leading to **anaemia**. These occur due to change in **11<sup>th</sup>** autosomal chromosome. It is a hereditary disease usually found among people living in high altitudes and Tribal Groups.

#### Haemophilia:

- Gene responsible for this disorder is linked with sex chromosome. This disease leads to failure of blood clotting. As a result, a person suffering from the disease may bleed to death even from minor cuts as the blood would not clot naturally. However, injections of the protein (factor VII) may save the person as it would cause normal clotting. Haemophilia is a **hereditary** disease it is known as royal disease and also **bleeder's disease**.

#### Color blindness:

- This disorder leads to failure to distinguished **red & green color**. The gene responsible for this disease is situated on sex chromosomes.

#### Huntington's disease:

- The disease is caused by a dominant autosomal gene which leads to progressive deterioration of the nervous system. A peculiar feature of the disease is that it develops at an age of 30 to 40 years and slowly leads to loss of control on the movement of limbs so that eventually the person becomes helpless and bedridden. Ultimately, the affected person dies some 10 to 15 years after the disease developed.

#### Thalassemia :

- Also called Cooley's anaemia, the disease occurs mostly in children and is nearly fatal. It occurs due to an abnormality of the heamoglobin controlled by a recessive gene which in homozygous condition causes severe anaemia.

## Plant Kingdom

### Types of plants & Habitat:

**Epiphytes:** grow on other plants but do not take nourishment from them.

**Xerophytes:** are adapted to grow in a dry habitat like deserts and can survive without moisture. Eg, cactus.

**Mesophytes:** live under condition intermediate between very wet and very dry.

**Hydrophytes:** are plants growing in water.

**Tropophytes:** Plants which grow luxuriantly in rainy season and shed all leaves in summer.

**Lithophytes:** Plants growing on rocks.

**Hydroponics:** is a method of cultivating plants without using soil but by using nutrient solution.

**Oxylophytes:** Plants growing on acidic soil.

**Halophytes:** Plants growing in saline water.

### **Phloem and Xylem:**

The tissue that involved in the transportation of food materials *from the leaves* to other parts of the plants is called '*Phloem*'.

The tissue that conducts water and nutrients upward *from the roots* to other parts of the plants is called '*Xylem*'.

### **Plant movements:**

- **Phototropism** means movements of plants towards light. Eg. Stem.
- The movement of plants organs in response to the force of gravity is called as **geotropism**.
- The movement of an organ induced by contact with a foreign body is called **haptotropism**.
- Water stimulus induced growth movements are called **hydrotropism**. Eg. Root.
- The curvature movements of plant parts in responses to the stimulus of contact are termed as **thigmotropism**.
- The instrument used to measure the growth of plants is known as **Auxanometer**.
- **Crescograph** is a device for measuring growth in plants. It is developed by Indian scientist **J.C. Bose**.

### **Plants hormones:**

- The hormone named **gibberellins** is responsible for stem elongation in plants.
- The plant hormone which helps in the flowering of plants called **florigen**.
- The hormone which responsible for the ripening of fruits is called **ethylene**.
- The process of conversion of atmospheric nitrogen in to ammonia is called Nitrogen fixation. The nitrogen fixing bacteria lives in the root tumours of pea plants is called **Rhizobium**.
- The most important part of the plant is **root**.
- The active cell division in a plant is found in tip of roots and shoots.
- Plants respire through **stomata**.

### **Photosynthesis:**

- It is the process by which green plants manufacture food in the form of carbohydrates by using water, CO<sub>2</sub> and sunlight.
- Carbon dioxide, water, chlorophyll and sunlight are necessary for photosynthesis.
- The site of photosynthesis is **chloroplast** in the cell.
- The only biological process which release oxygen into the atmosphere is **photosynthesis**.
- The process of photosynthesis is a reaction of oxidation and reduction. Oxidation of water takes place forming oxygen and reduction of carbon dioxide takes place forming glucose.
- The green colour of the plants is due to the presence of **chlorophyll**.
- **Magnesium** is an important part of chlorophyll, a plant pigment important in photosynthesis.

## Animal Kingdom

- Unicellular organisms consists of a single phylum is called Protozoa. Eg. Ameoba, Euglena, Trypanosoma etc.,
- The smallest form of animal life is bacteria.

### Fishes:

- Fishes are aquatic Vertebrates.
- Fishes respire through **gills**.
- The study of fish is called **Ichthyology**.
- Fishes are cold blooded organism and they have two chambers of heart.
- The most developed and intelligent aquatic animal is **Dolphin**.

### Mammals:

- Any animal of which the female feeds their young ones milk from their own body. Eg. Humans, Dogs, Elephants, **Dolphins**.
- Most mammals give birth to young ones, not eggs.
- Some mammals which lay eggs. Eg. **Platypus, Echidna**.
- **Bat** is the only mammal which can fly.
- The mammal of an order whose members are born incompletely developed and are typically carried and suckled in a pouch on the mothers belly is called **Marsupials**. Eg. **Kangaro**.
- The animal which has the largest teeth is Elephant. Elephants tusks act as the teeth.
- The animal having the longest life span is **Turtles and tortoises**.

- Biggest mammal- Blue Whale.
- Largest land animal- African Elephant
- Fastest animal-Cheetah
- Tallest animal-Giraffe
- The largest ape-Gorilla
- The smallest ape -Gibbon
- The most intelligent ape-Chimpanzee
- Most venomous snake-King Cobra
- The largest snake-Anaconda
- Only snake which makes nests-Cobra
- Only poisonous lizard-Heloderma
- Largest reptile-Crocodile
- Large long winged sea bird-Albetros
- The tallest living bird-Ostrich
- Flying Mammal-Bat
- The smallest flightless bird-Kiwi
- Smallest flying bird-Bee humming bird

## Human Body

- A balanced diet is one that gives your body the nutrients it needs to function correctly.
- Normally a balanced diet should provide about **3000 calories** per day for a normal adult.

### Carbohydrates:

- Carbohydrates are organic compounds containing carbon, hydrogen and oxygen which constitute sugars (starch, cellulose, glucose etc.) and supply calories for body activity.
- The sources of carbohydrates: rice, wheat, honey, sugar, potato, carrot.
- Lactose is more commonly known as **milk sugar**.
- Lactose of milk is the most important carbohydrate in the nutrition of young mammals.
- **Classification of carbohydrate:** Carbohydrates are classified into three major groups.
  - **Monosaccharides:** These are the simple sugar made up of single **polyhydroxy** or **ketone unit**. Most abundant monosaccharides found in nature is glucose containing six carbon atom. Triose, tetrose, pentoses, heptoses are the type of monosaccharides.
  - **Oligosaccharides:** when 2 to 10 monosaccharides join together they form oligosaccharides. They are usually crystalline in nature and sweet in taste. **Maltose, sucrose, lactose** are disaccharides made up of two monosaccharides.
  - **Polysaccharides:** These are the compounds of sugar which are formed due to the joining of large number of monosaccharides. They are insoluble and tasteless. Eg. starch, glycogen, cellulose, chitin etc.,

### Proteins:

- Proteins are highly complex nitrogenous compound found in all living organisms.
- Proteins are essential for growth and repair of the body tissues. They also provide energy when calories are deficient.
- They are known as **body builders**.
- Protein deficiency causes **Kwashiorkar**. In this disease hand and legs of children get slimmed and the stomach comes out.
- Deficiency of protein and carbohydrate results in **Marasmus**. In this disease muscles of children are loosened.

### Vitamins:

- Vitamin was invented by Sir. **F. G. Hopkins**. The term vitamin was coined by **Casimer Funk**.
- Vitamins are organic compound required in minute quantities. No calorie is obtained from it, but it is very important in regulating chemical reactions in the metabolism of the body.
- On the basis of solubility, vitamins are of two types:
  - **Vitamin soluble in water:** Vitamin- B, and Vitamin- C.
  - **Vitamin soluble in fat :** Vitamin -A, Vitamin- D, Vitamin- E and Vitamin -K.
- Synthesis of **Vitamin-D** takes place by the ultra violet rays present in the sunlight through cholesterol of skin.
- **Vitamin –C** is in destroyed by heat and light, so this vitamin easily destroyed during cooking.
- Vitamin C is also known as **Ascorbic acid**. Vitamin C is the first vitamin produced synthetically.
- The metal ion present in Vitamin B<sub>12</sub> is **Cobalt**.
- The vitamin E is also considered as a **hormone**.

### Diseases caused by the deficiency of vitamins:

Vitamin	Chemical name	Deficiency diseases
Vitamin -A	<b>Retinol</b>	<b>Nightr blindness, Xerophthalmia</b>
Vitamin –B <sub>1</sub>	<b>Thiamine</b>	<b>Beriberi</b>
Vitamin –B <sub>2</sub>	<b>Riboflavin</b>	Cracking of skin, red-dish eye
Vitamin – B <sub>3</sub>	Niacin	Whitening of hair, mentally retardness
Vitamin – B <sub>5</sub>	Pantothenic acid	Pellagra or 4-D Syndrome
Vitamin – B <sub>6</sub>	Pyridoxine	Anemia, skin disease
Vitamin – B <sub>7</sub>	Biotin	Neurotic disorder
Vitamin – B <sub>11</sub> & B <sub>9</sub>	<b>Folic acid</b>	Anemia, dysentery
Vitamin – B <sub>12</sub>	Cobalamine	Macrocytic anemia
Vitamin - C	<b>Ascorbic acid</b>	<b>Scurvy</b> , Swelling of gums
Vitamin - D	<b>Calciferol</b>	<b>Rickets</b> (in children), Osteomalasia (in adults)
Vitamin - E	<b>Tocopherol</b>	<b>Infertility</b>
Vitamin - K	Phylloquinone	Non-clotting of blood ( Bleeding)

### Disease caused by Viruses:

Disease	Affected organ
AIDS	Immune System (WBC)
Dengue fever	Whole body particularly head, eyes and joints
Polio	Throat, backbone Nerve
Influenza (flu)	Whole body
Chicken pox	Whole body
Small pox	Whole body
Measles	Whole body
Trachoma	Eyes
Hepatitis or Jaundice	Liver
Rabies	Nervous system
Meningitis	Brain
Herpes	Skin

### Diseases caused by Bacteria:

Disease	Affected organ	Causes
Tetanus/Lockjaw	Nervous system	Closetredium Tetani,
Cholera	Intestine	Vibriocholerae
Typhoid	Intestine	Salmonella typhi
Tuberculosis	Lungs	

Diphtheria	Respiratory tube	
Plague	Lungs, area between the two legs	Pasteurella pestis spread by infected rats
Whooping cough	Respiratory system	
Pneumonia	Lungs	
Leprosy	Nervous System Skin	Mycobacterium leprae
Gonorrhoea	Urinary Path	
Syphills	Urinary path	
Septic sore throat	Throat	Streptococcus (SP)

#### Disease caused by **Protozoa**:

Disease	Pathogen Responsible and mode	Affected area
Malaria	Plasmodium through infected female anopheles mosquito.	
Amoebic dysentery 'amoebiasis'	Entamoeba histolytica	Large intestine
Sleeping sickness	Typanosoma brucei through flies	Lymph nodes
Kala-azar or black sickness	Leishmania donovani through the bite of sand fly.	
Diarrhoea		It cause wounds in the intestine.

#### Disease caused by **fungus**:

Disease	Affected area	Other information
<b>Athelete's foot</b>	Foot	It is caused by fungi called Trichophyton
<b>Ringworm</b>	Skin	It causes red round spot on the skin.
Scabies	Skin	It causes white spot on the skin.
Asthma	Lungs	It obstructs the function of lungs.

#### Diseases and Treatments:

- **Schizophrenia:** This is a mental disease which usually found in youth. The patient considers the imagination as a truth, not to the facts. These patients are lazy, emotionless etc. Electropathy is helpful in this disease.
- **Epilepsy :** This disease is caused by the internal disturbance of brain. In this disease foam coming out of the mouth and the patient falls down unconscious.
- **Diplopia:** This disease is caused by the paralysis of muscles of the eyes, in which double image is formed.
- **Eczema** is a disease which affects Skin.
- **Bronchitis:** It is caused by the inflammation of tubes leading from the wind pipe to lungs.
- **Triple Antigen or DPT:** is used for the treatment against diphtheria, whooping cough and tetanus.
- **ORT (Oral Rehydration Therapy)** is useful in combating cholera, dysentery and gastroenteritis.
- **BCG-** is the vaccine used for the treatment against **Tuberculosis**.
- **OPV** - is the vaccine given to children against **Polio**.
- To prevent polio, two vaccines **Sabin (oral) and Salk (injectable) vaccine** is used.
- **Malaria-** is spread by female anopheles mosquitoes and it affects the RBC. Quinine is the **alkaloid** that cures malaria. **Quinine** - is extracted from the tree cinchona.
- Malaria is also known as **Marsh disease**.
- **Quinine, Tannin and Cinnamon** are obtained from the bark of the tree.
- Filaria or Elephantiasis is spread by **Culex mosquito**.
- The chief ingredient of the mosquito repellent cream is derived from **neem** plant.
- **Hydrophobia** – is a disease caused by the bite of the dog. Hydrophobia is commonly known as **Rabies**.
- **Louis Pasteur** invented vaccine against Rabies. It is known as **Anti-Rabies venom**.
- Louis Pasteur is a scientist who formulated a **Germ theory of disease**.
- **Shanvac-B** is India's first indigenous genetically engineered Hepatitis- B vaccine.
- **Penicillin** is the first anti biotic discovered in the world in **1928 by Alexander Fleming**.
- Penicillin is produced from fungus known as **Penicillium notatum**.

- **LSD (Lysergic acid diethylamide)** is a hallucinogenic drug.
- **Biopsy** is done in order to detect the presence of cancer. It examines tissue cut from living body.
- **Arsenic-74** is used to detect tumours.
- **Euthanasia** means mercy killing. It was first introduced legally in **Netherlands**.
- **Acupuncture** is a famous treatment which is common in China.
- **Lithotripter** is the machine used to break up kidney stones by ultra sound waves.
- The name of the vector causing chickungunya is known as **Aedes aegypti**.
- **Alzheimer's** disease affects the brain.
- The disorder of **Somnambulism** is commonly known as sleep walking.
- **Trypanosoma** causes disease known as sleeping sickness.
- **Azidothymidine (AZT)** is a drug used to combat AIDS.
- **Plague** is called black death disease.
- Tuberculosis is the disease which is known by **White Plague**.
- **Cerebral palsy** A condition marked by impaired muscle coordination (spastic paralysis) and /or other disabilities, typically caused by damage to the brain before or at birth.
- **Zika-** zika fever (also known as Zika virus disease) is an illness caused by the Zika virus. Most cases have no symptoms, but when present they are usually mild and can resemble dengue fever. Symptoms may include fever, red eyes, joint pain, headache, and a maculopapular rash.  
Zika originated in Brazil (2015) and later spread to South America and Central Asia.
- **Ebola virus disease** is a viral hemorrhagic fever of humans caused by Ebola virus. Its symptoms are fever sore throats. The disease originated in West Africa.
- The virus that spreads bird flu is **H5N1**.
- The disease caused by the deficiency of **Nicotinic acid** is known as '**Pellagra**'.
- The **Blight** disease in paddy is caused by **Bacteria**.
- **Dermatitis** is a skin disease caused due to the deficiency of **biotin**.
- The common name of whooping cough is called **Pertussis**.
- Pyorrhoea is a disease which affects gums of the teeth
- Arthritis is a disease which affects joints.
- Bright Disease is a disease which affects kidney.
- Osteomyelitis is a disease which affects bones.

#### Important Vaccines:

Vaccine	Discovered by
Small pox	Edward Jenner
Cholera	Louis Pasteur
Polio Vaccine	Jonas E. Salk
Oral Polio Vaccine	Albert Bruce Sabin
T B Vaccine	Leon Calmetta and Camille Guerin

#### Water:

- Water is the important component of our body. **65-75%** weight of the body is water.
- Water helps in eliminating waste from the body.
- It regulates the body temperature.

#### Digestive system:

- Saliva in the mouth helps in digestion.
- **Hydrochloric acid** produced in the stomach help in digestion.

#### Liver:

- Liver is the **largest gland** of the human body. Its weight is approximately 1.5 to 2 kg.
- Liver is considered as the **chemical laboratory** of the human body.
- Liver is the organ which produce most heat in the body.
- **Bile** is secreted through liver. Bile accelerate the reaction of enzymes present in the intestine.
- Bile is stored in the **gall bladder**.
- **Bilirubin & Biliverdin** are bile pigments.

- The poisonous substance formed in liver is **Ammonia**.
- In case of decrease of fat in food liver converts some of the parts of the carbohydrates into fat.
- The production of **fibrinogen** protein takes place in the liver which helps in clotting of blood.
- The production of **Heparin** protein takes place in liver which prohibits the clotting of blood inside the body.
- The disease which affects the liver due to any obstruction in the bile duct is **Jaundice**.
- Bleeding in liver is known as **liver cirrhosis**.
- Excessive alcoholic consumption causes **liver cirrhosis**.
- **Hepatitis** is the viral disease of liver which influence the functioning of liver.
- **Urea** is produced in liver.
- The pH value of normal human urine is **pH-6**.

#### Respiratory system:

- **Lungs** are the respiratory organ in higher vertebrates (man)
- The double membrane which covers lungs is called **Pleurae**.
- The organ without muscle is lungs
- **Pneumonia, pleurosis, bronchitis and silicosis** are diseases affecting respiratory tract.
- **SARS (Severe Acute Respiratory Syndrome)** a lung disease, is caused by **Corona Virus**.
- Oxygen starvation due to low atmospheric oxygen is called **asphyxia**.
- **Hypoxia** refers to a general low level of oxygen availability. Physiologically it refers to a deficiency of oxygen at the tissue level
- Cigarette smoking leads to disease **Emphysema**.
- Respiration is controlled by **medulla oblongata**.
- **Pneumoconiosis** is an occupational lung disease of people who work in **coal mines**.

#### Heart:

- Heart is the pumping organ of the blood circulatory system.
- The average weight of the heart is about **340 g** in men and **225 g** in women.
- The **pericardium** protects heart from harmful things.
- The blood vessels carrying the blood from the body towards the heart is called **vein**.
- In the vein there is impure blood i.e, carbon dioxide mixed blood. Its exception is **pulmonary vein**, which always carry pure blood.
- **Pulmonary vein** carries the blood from lungs to left auricle. It has pure blood.
- The blood vessels carrying the blood from the heart towards the body is called **artery**.
- In artery there is pure blood i.e, oxygen mixed blood. Its exception is pulmonary artery.
- **Aorta** is the largest artery, which carries oxygenated blood.
- **Pulmonary artery** carries the blood from right ventricle to lungs. It contains impure blood.
- The artery carrying blood to the muscles of the heart are called **coronary arteries**. Any type of hindrance in it causes heart attack.
- The condition of faster heart beat is called **Tachycardia**.

#### Blood:

- Blood is a fluid connective tissue.
- The blood circulation in our body was invented **William Harvey**.
- The quantity of blood in the human's body is **7%** of the total weight.
- This is a dissolution of base whose pH value is 7.4
- There is an average of **5-6 liters** of blood in human body.
- Blood is consist of two part:  
(A) Plasma (B) Blood corpuscles.

#### Plasma:

- This is the liquid part of blood. **60%** of the blood is plasma.
- 90% of the plasma constitutes water.
- Plasma helps in the transportation of digested foods, hormones etc.

#### Blood Corpuscles:

- This is the remaining 40% part of the blood. This is divide in to three parts.

1) Red Blood Corpuscles (RBCs) 2) White Blood Corpuscles (WBCs) 3) Blood Platelets.

### **Red Blood Corpuscles (Erythrocytes) :**

- RBC is formed in **Bone marrow**.
- Its life span is **120 days**.
- Its destruction takes place in liver and spleen. Therefore, liver is called **graveyard** of RBC.
- It contains **haemoglobin**, in which haeme is iron containing compound and due to this the colour of blood is **red**.
- The iron compound found in hemoglobin, as **haematin**.
- The main function of RBC is to carry oxygen from the lungs to all cells of the body and bring back the carbon dioxide.
- **Anemia** is a disease caused due to the deficiency of hemoglobin.

### **White Blood Corpuscles (WBCs):**

- White blood Corpuscles is known as **Leucocytes**.
- The largest leucocytes is **Monocytes**.
- The smallest leucocytes is **Lymphocytes**.
- The **lymphocytes** are capable of producing antibodies.
- The Leucocytes which are modified as scavenger cells is called **Monocytes**.
- The Leucocytes that are able to produce the anticoagulant heparin are **Basophils**.
- In shape it is similar to that of Amoeba. Its formation takes place in **Bone marrow**.
- Its life span is from **2 to 4 days**.
- Nucleus is present in the **White Blood Corpuscles**.
- Its main function is to protect the body from diseases. The ratio of RBC and WBC is **600 : 1**.
- **Leukaemia**: A malignant progressive disease in which the bone marrow and other blood-forming organs produce increased number of immature or abnormal leucocytes. These suppress the production of normal blood cells, leading to anaemia and other symptoms. It is better known as **Blood Cancer**.
- **Leucopenia**: The decrease in the total number of white blood cells, or leukocytes, circulating in the blood is defined as leucopenia.

### **Blood Platelets:**

- Blood Platelets are also known as **Thrombocytes**.
- The main function of blood Platelets is to help in **clotting of blood**.
- Clotting of blood in blood vessels is called **thrombosis**.
- The formation of platelets take place in **bone marrow** and it dies in **spleen**.
- Platelets has no colour.
- In dengue fever number of platelets are reduced.
- Dengue fever is also known as **Break bone fever**.

### **Blood Pressure:**

- **Systole** is the contraction of ventricles of **heart**. The muscular relaxation that follows systole is called **diastole**.
- In measuring the blood pressure in the artery of the arm, the doctors notes both systolic and diastolic pressure.
- These are the maximum and minimum pressure respectively
- The normal blood pressure of a healthy adult is **120/80 mm Hg**.
- **120 mm Hg** is known as **systolic pressure** and **80 mm Hg** is known as **diastolic pressure**.
- **High blood pressure or Hypertension** is known as the **Silent killer**.
- The instrument used to measure the blood pressure in Human body- **Sphygmomanometer**.

### **Diseases Caused by Blood Disorders:**

- When the Hemoglobin in the blood becomes too low it results in disease called **Anemia**.
- So, it is also said that Anemia is the disease which is caused by the deficiency of iron.
- **Haemophilia** is a genetic illness that causes dysfunction in one of the blood's clotting mechanisms.
- Abnormal increase in WBC count is known as **leukemia** or blood cancer.

### **Blood Groups:**

- Blood groups are discovered by **Karl Landsteiner**.

- The blood groups are A, B, AB and O.
- Blood group **AB** is called **Universal Recipient** because it does not contain any antibody.
- Blood group **O** is called **Universal Donor** because it does not contain any antigen.
- The World Blood Donor Day is **June 14**. The National Blood Donor Day is **October 1**.

#### Rh factor:

- In the year 1940, **Landsteiner** and **Wiener discovered** a different type of antigen in the blood.
- They discovered it in the Rhesus monkey, therefore, it is called **Rh factor**.

#### Excretory System:

- The **kidneys** are the chief excretory organs of vertebrates.
- The main excretory organ of insects is called **Malpighian tubule**.
- Outer darker region of kidney is named as **cortex**.
- Inner pale region of each kidney is known as **medulla**.
- The functional unit of kidney-**Nephron**.
- Major hormones secreted by kidney – **Erythropoietin, calcitriol and rennin**.
- Presence of excess urea in the blood is called **Uremia**.
- Uremia is also called as the condition when both kidneys fail to function.
- **Dialysis** is used in the case of a patient suffering from kidney trouble – Uremia.
- When kidney does not remove sufficient water from the blood water accumulates in the tissue of the body, causing swelling known as **oedema or dropsy**.
- Normal urine is about **95% water** and **5% dissolved salts**.
- Urine is acidic. Its pH value is **6**.
- The pigment, which gives yellow color to Urine, is **Urochrome**.

#### Nervous System:

- Nervous System is the chief controlling and coordinating system of the body.
- The Central Nervous System is made up of two parts- Brain and Spinal Cord.
- Brain is covered by membrane called **meninges**. It is situated in a bony box called **cranium** which protect it from external injury.
- The weight of the brain in an adult **male is 1.4 kg** and **1.3 kg** in case of a **woman**.
- The largest part of the human brain is **Cerebrum**.
- The cerebrum controls thought and action.
- The seat of memory in human brain is located in **Cerebrum**.
- **Cerebellum** is second largest portion of brain located at the base, under the cerebrum.
- Cerebellum is known as **Little brain**. The **Cerebellum** controls voluntary movement of muscles and maintains balance
- **Thalamus** in the brain is considered as the relay centre of our body.
- The **Medulla oblongata** controls the involuntary actions. It is the lowest portion of the brain.
- **E.E.G (Electro Encephalogram)** is used to record changes in the electric potential in various areas of brain.
- Disorder of brain affecting recognition of letters and words is **Dyslexia**.
- **Encephalitis** is a disease affecting brain. It is caused by virus.
- **Biological** death of a patient means the death of tissues of the brain.

#### Hypothalamus :

- **Hypothalamus** controls the hormonal secretion of endocrine glands.
- It is the **temperature regulator** of the body.
- **Hypothalamus** is the center of hunger, thirst, temperature control, love, hate etc.
- The hormone secreted by Hypothalamus is known as **Vasopressin** and **Oxytocin**.
- **Diabetes Insipidus** is a hypothalamic disorder caused by Hyposecretion of ADH hormone (Anti Diuretic Hormone) or Vasopressin.
- In this type of diabetes excess urine is secreted by the patient and it causes dehydration.

#### Skin:

- It is the **largest organ** of the human body.

- The outer layer of the skin is termed as **epidermis**, which has no nerves or blood vessels and is continuously renewed.
- Inner layer, called **dermis**, is a thick layer below the epidermis which contains nerves, blood vessels, hair follicles, sebaceous gland and sweat glands.
- Colour of the skin is due to the presence of the pigment, **melanin**, in epidermis.
- The disorder characterized by absence of melanin is called **albinism**.
- **Sweat glands** seen in dermis layer help to eliminate excess heat from the body.
- **Sebaceous** gland in the skin secretes sebum which keeps the skin oily.

#### Eyes:

- The outermost layer of eye is Opaque, white, fibro elastic capsule called **sclera**. This is continuous with a transparent layer called cornea (bulged white part of the eye)
- The membrane that covers cornea is **conjunctiva**.
- The part of the Eye which is involved in eye transplantation surgery is **Cornea**.
- A pigmented, muscular, opaque diaphragm called **Iris** extend from ciliary body in front of lens. It can be seen as a black screen through the cornea and has a small central aperture called **Pupil**.
- Retina is the inner most light, sensitive – layer of the eye.
- It acts like a film in the camera.
- Retina contains photoreceptors like '**rods**' and '**cone**' cells.
- **Cone cells** are for bright light vision and colour vision. Hen's eye contain cones only
- **Rod cells** are for dim light vision. Owl's eye contains rods only
- Blind spot are the area of the eye where there is no photoreceptors and hence no image is formed there.
- Enzyme present in tears is called **Lysozyme**.
- The word Twenty -Twenty is related to **Perfect vision**.

#### Eye Defects: Myopia:

- Here a person can see objects near to him. So, this is also known as short sightness.
- A person suffering from Myopia cannot see far away objects clearly. Here the image of the object is formed **in front of the retina**.
- Causes of Myopia
  1. Elongation of eye ball along the axis
  2. Shortening of focal length of eye lens
  3. Over stretching of ciliary muscles beyond the elastic limit
- This can be rectified by using **concave lens**.

#### Hypermetropia:

- This disease is caused due to the shortening of eyeball.
- A with Hypermetropia can only properly see far away objects.
- The image of near objects is not clear to him. Here the image of near objects is formed behind the retina.
- Causes of Hypermetropia
  1. Shortening of eye ball along the axis
  2. increase in focal length of eye lens.
  3. Stiffening of ciliary muscles
- This can be rectified by using **convex lens**.

#### Astigmatism:

- Curvature of cornea become irregular and image is not clearly formed.
- This can be rectified by using **Cylindrical lens**.
- The other diseases, which affects eye, are Glaucoma, Trachoma, Xerophthalmia, Photophobia, Cataract, Colour blindness, Night blindness etc.

#### Endocrine system:

- Exocrine glands: Glands which have duct are called exocrine gland. Eg. Digestive gland, sweat gland, Mucous gland etc.
- Endocrine glands: there are ductless glands. Hormones are secreted by these glands.

#### Pancreas Gland:

- This is the second largest gland of the human body. It acts as both exocrine and endocrine gland.
- Islets of **Langerhans** is a part of the pancreas. **Insulin** is secreted by beta cells of the islets of langerhans.
- Diabetes mellitus is the type of diabetes caused due to deficiencies of insulin produced by pancreas. That means it is a beta cell disorder, this causes excess glucose level in the blood.
- Insulin is discovered by **Banting and Best**.
- Diabetes is caused by the deficiency of insulin.

#### **Pituitary Gland:**

- Pituitary gland is an endocrine gland attached to the base of the brain.
- This is also known as master gland.
- Pituitary gland is controlled by hypothalamus.

#### **Thyroid Gland:**

- Thyroid gland is the **largest** endocrine gland in the human body.
- It is popularly known as **Adam's Apple**.
- **Iodine** is required for the proper functioning of thyroid gland.

#### **Diseases caused by the deficiency of Thyroxin:**

- **Goiter:** This disease is caused by the deficiency of Iodine in food. In this disease the shape of the thyroid gland enlarge abnormally.
- **Cretinism:** This disease affects the children. The mental and physical retardness of the child.
- **Hypothyroidism:** This disease is caused by the chronic deficiency of thyroxin hormone. Sometimes the affected person become dumb and deaf.
- **Exophthalmic Goiter:** This disease caused by the excessiveness of thyroxin. It is also known as **Graves disease**.

#### **Adrenal Gland:**

- Adrenal glands are situated **over** the kidneys.
- Adrenal gland is known as **emergency gland** or stress gland.
- Adrenalin is the hormone when a person gets **feared**.

#### **Pineal Gland:**

- The smallest endocrine gland in human body is **Pineal gland**
- **The gland known as biological clock** is Pineal gland
- **Melatonin and Serotonin** are two hormones secreted by Pineal gland.
- **Melatonin** helps to maintain circadian rhythm and regulate **reproductive hormones**.
- Of the endocrine organs, the function of the pineal gland was **the last discovered**.
- Located deep in the centre of the brain Pineal gland was once known as the '**third eye**'

#### **Thymus Gland:**

- Thymus gland is known as **juvenile gland**.
- Thymus glands get fully developed by about 7 years and degenerate and disappear after 14 years, because of the activities of sex glands.

#### **Reproductive Systems:**

- Reproduction is a process by which an organism produces new individuals or off springs of its own species.
- Vasectomy and Tubectomy are birth control measures.
- **Vasectomy** is the sterilization process used in male.
- **Tubectomy** is the sterilization process in female.
- Important male sex hormone is **testosterone** and female sex hormone is **estrogen**.
- The sex of a child is determined at the time of **fertilization of the ovum**.
- The average gestation period of a sheep is **150 days**.
- The average gestation period of a human is **280 days**.
- The average gestation period of a Elephant is **20-22 months**.

### Skeletal System:

- Skeletal system provides definite shape to the body.
- The element which is important in maintaining normal muscular activity in heart and Skelton muscles is **potassium** and **sodium**.
- The number of vertebra in human skeleton is **33**.
- The total number of bones in human body is **206**.
- The total number of bones of a new born baby is **300**.
- The smallest bone of the body is **stapes** (bone of ear)
- The largest bone of the body is **femur** (thigh bone)
- **Tibia** is born found in the leg.
- '**Scapula**' is a bone located in shoulder.
- **Osteoporosis** is a bone disorder common in women over 50 years, and is characterized by decreased bone mass and increased chances to fractures.
- Number of muscles in our body varies from around **640-850**.

### Teeth:

- The first teeth in humans are called milk teeth.
- A grown up man has **32 teeth**.
- Teeth is made up of **dentine**.
- The hardest material found in human body is **enamel**.
- **Fluorides** are the compounds that prevent tooth decay.
- The main component of teeth and bones is **Calcium Phosphate**.
- **Pyorrhoea** is a disease which affects the gums of the teeth.

### Name of Drugs:

- The study of action of Drugs is called **Pharmacology**.
- **Analgesics**: Drugs that used to prevent or relieve pain. Eg. Aspirin.
- **Antibiotics**: Drugs that are used to prevent growth of bacteria or other germs. Eg. Penicillin.
- **Antipyretics**: Drugs that are used to lower body temperature.
- **Tranquillizers**: Drugs that calm nervous system and prevent worry and tension.

### Miscellaneous Facts

- Butterfly lays eggs in **water**.
- Bio diesel is mainly produced from the plant **Jatropha**.
- The pulse, which is considered as the substitute of milk, is **Soya bean**.
- Pasteurization of milk is heating it to **62° C - 63° C**.
- Purity of milk is measured by **Lactometer**.
- Milk taste sour when kept in open for sometime due to the formation of **lactic acid**.
- Souring of milk is due to the activity of **lactobacillus**.
- The Anti-viral chemical produced by animal cell is **interferon**.
- **Vermi composting** is used for biodegradable waste management.
- The creature, which has a shortest lifespan, is **mayfly**.
- Mango juice is obtain from **epicarp**.
- Acid present in Ants is **formic Acid**. Formic acid is used for **solidifying latex**.
- Plants are made disease resistant by crossing them with **wild relatives**.
- **Hyperglycemia** is due to excess of sugar in blood.
- **BOD** means Biological Oxygen Demand. The estimation of BOD gives an idea of the amount of pollution in water.
- Pulses are obtained from the family of **Leguminosase**.
- Alfatoxine is a poison produced by a fungus called **Aspergillus** flavors.

- Insects belong to the group **Arthropod**.
- The father of Indian Environmental science is **R. Mishra**.
- The birth place of **Jersy Cow** is **England**.
- The name of seedless mango is **Sindhu**.
- '**Eustachian tube**' connects Ear and throat.
- The organ which is not affected by cancer is **Heart**.
- The scientist who coined the word '**Ecology**' is **Ernst Haeckel**.
- The pollination by animals is known as **Zoophily**.
- The pollination by wind is known as **Anemophily**.
- The pollination by bat is known as **Chiropterophily**.
- Theory of inheritance of acquired characteristics was propounded by Lamarck. His famous book is **philosophi zoologique**
- Theory of natural selection is a theory propounded by Charles Darwin. He formulated this theory based on the experiments he conducted in **Galappagos islands**.
- Origin of Species is the famous book written by Darwin. His other famous work is **Voyage of Beagle**.
- The pollination by water is known as **hydrophilic**.
- The chemical compound used to detect the presence of Glucose is **Benedict's reagent**.
- The Indian scientist who discovered genetic code is **Hargobind Khorana**.
- The chemical substances used to increase the taste of food are called **Ajinomoto**.
- The largest herb in the world **Banana**.
- The largest grass in the world **bamboo**.
- **Tulsi** is the plant, which produces Ozone at the time of photosynthesis.
- The substance known as **Tar** contained in Cigarette smoke causes bronchitis
- **Hippocrates** is known as the father of Modern Medicine.

## Medical Science

### Diagnostic Instruments:

- **Electro Cardiograph (ECG)** It helps to diagnose heart disease.
- **Wilhelm Einthoven** discovered ECG.
- **Electro Encephalograph (EEG)** – It is used to measure electrical activity of brain.
- Hans Berger successfully recorded for the first time EEG of man.
- Electromyography (EMG) – used to record muscles action potential.
- Otoscope is an instrument used for examining the outer ear and ear drum.
- The inventor of CT Scan (Computer Tomographic Scan) is **Godfrey Hounsfield**.
- CT Scan is used to scan internal parts through use of radioactive isotopes.
- **CAT Scanning (Computerised Axial Tomography)** –It helps to show condition of soft tissues of body through use of X-ray.
- **Endoscope**- Instrument used for internal examination by direct vision through lighted tubes fitted with a system of lens.
- Father of Indian Surgery is **Susrutha** .
- The first person to conduct the antiseptic surgery is **Joseph Lister**
- The first person to conduct heart transplantation surgery is **Christian Bernard** in South Africa
- The first person to conduct heart transplantation surgery in **India** is P .Venugopal.
- First Test tube Baby is **Louise Joy Brown**.
- The First test tube baby In India is **Durga**

## Glossary

- **Adenosine triphosphate (ATP):** A compound containing three phosphate groups carrying two high energy bonds; the source of high energy phosphate for energy requiring reactions in cells.
- **Aestivation:** Dormant state of decreased metabolism in which certain animals pass periods of drought or high temperatures.
- **Anoxia:** Literally no oxygen in the tissues.
- **Antibody:** A protein produced in response to the presence of some foreign substance in the blood or tissues.
- **Antigen:** A foreign substances, usually protein in nature, which elicits the formation of specific antibodies within an organism.
- **Apogamy:** The development of a plant (sporophyte) without the fusion of gametes.
- **Bacteriophage:** Virus which infects and may kill bacteria.
- **Chemosynthesis:** Synthesis of food (organic substances) by some autotrophic bacteria obtaining energy for the process from the oxidation of inorganic substances.
- **Cryosurgery:** A surgical technique of destroying a tissue by extreme cooling
- **Diathermy:** A technique of generating heat in a tissue by means of high frequency electric current
- **Fibrinogen:** A soluble protein of the blood from which is produced the insoluble protein called fibrin, essential to blood coagulation.
- **Glycolysis:** Anaerobic process of breaking down of glucose into two molecules of pyruvic acid that occurs in the cytoplasm.
- **Heterotrophs:** Organisms that cannot make their own food from inorganic materials and therefore must live on either autotrophy or decaying matter.
- **Hibernation:** The dormant state of decreased metabolism in which certain animals pass the winter.
- **Homeostasis:** The tendency to maintain stability in the internal environment despite changes in the external environment.
- **Lichen:** A symbiotic association of an alga and a fungus often growing on rocks and tree trunks.
- **Lipids:** Oily or waxy substance that are insoluble in water but soluble in organic solvents like benzene, acetone, petroleum, ether etc. e.g. all kinds of oils and waxes, vegetable and desi ghee, cholesterol and other steroids.
- **Metastasis:** The transfer of disease from one organ or body part to another that is not connected to it, an important event in cancer.
- **Monoecious:** Plants having male and female flowers or sex organs on the same plant, e.g. maize, castor, cucumber and the moss plant, *Funaria*.
- **Nitrification:** The oxidation of ammonia and ammonium salts into nitrates by the activity of some bacteria. The bacteria involved are thus, called nitrifying bacteria.
- **Omnivore:** An organism that can eat both plant and animal material.
- **Parthnocarpy:** The phenomenon of the development of fruits without the formation of seeds because of lack of pollination, fertilization, or embryo development.
- **Symbiosis:** An association between two or more species of organisms to their mutual benefit.
- **Thrombin:** The enzyme derived from prothrombin which converts fibrinogen to fibrin; participates in blood clotting.
- **Trisomy:** A condition in which a particular chromosome is present in the body cells in triplicate rather than in duplicate, e.g. in the body cells of certain individuals suffering from Down's syndrome, the chromosome 21 is found in triplicate.
- **Vector:** An organism that transmits pathogens or parasites.