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BIOLOGY NOTES PART-1 FOR RRB ALP AND GROUP D EXAMS



IMPORTANT SCIENTISTS RELATED TO BIOLOGY

A Biologist best known for his science of evolutions	Charles Darwin
French Biologist known for his discoveries of the Principals of Vaccination and Pasteurization	Louis Pasteur
American Molecular Biologist known for his contribution to the discovery of structure of DNA with Francis Crick and Rosalind Franklin in 1953	James Watson
Scottish Physican known for his discovery of enzyme and the world's first antibiotic substance benzyl penicillin (Penicillin G)	Alexander Fleming
German Microbiologist credited as the founder of modern bacteriology	Robert Koch
Renowned Swedish Botanist Known for Binomial Nomenclature, Taxonomy	Carl Linnaeus
German botanist and co-founder of Cell Theory along with Theodor Schwann and Rudolf Virchow	Matthias Jakob Schleiden
Italian biologist and physician, who is referred to as the Father of microscopical anatomy, histology, physiology and embryology	Marcello Malpighi
German Jewish physician and scientist who worked in the fields of hematology, immunology, and antimicrobial chemotherapy	Paul Ehrlich
Austrian biologist, physician, and immunologist credited with the development of Blood Group System, discovery of Rh Factor and Poliovirus	Karl Landsteiner

French physician who won the Nobel Prize in Physiology in 1907 for his discoveries of parasitic protozoans as causative agents of infectious diseases such as malaria and trypanosomiasis	Charles Louis Alphonse Laveran
Estonian scientist considered as the founding father of embryology	Karl Ernst von Baer
Romanian-American cell biologist. Described as "the most influential cell biologist ever", in 1974 he was awarded the Nobel Prize in Physiology and Medicine along with Albert Claude and Christian de Duve	George Emil Palade
Dutch microbiologist and botanist and often considered one of the founders of virology and environmental microbiology	Martinus Beijerinck

IMPORTANT ON-LINERS IN BIOLOGY FOR RRB EXAMS (ALP AND GROUP D), SSC EXAMS, UPSC EXAMS

CELL

- ❑ Cell is the basic building block of all living Organisms, it is the smallest unit of Organisation in a living thing.
- ❑ There are two types of Cells: Prokaryotes and Eukaryotes

Prokaryotes	Eukaryotes
Cells of Organisms which have no defined nucleus	Cells of Organisms which has a defined nucleus

Uni – Cellular	Multi – Cellular
No Cell Organelles	Multi Cell Organelles with Special Function
Bacteria	Fungi, Animals and Plants
<p>Cell Membranes : Compartments of cell surrounded by a thick membrane are called Cell Membrane, which is common to both the types of cell and that holds all cell fluids inside and keeps foreign body away from the Cell</p>	

- ❑ Cell was first discovered and coined by Robert Hooke in 1665
- ❑ Theory of Cell is first credited to Theodor Schwann and Matthias Jacob in 1830s
- ❑ Cell Nucleus was first described by Franz Bauer in 1804 however, the discovery is credited to Scottish Botanist Robert Brown in 1831 for his detailed description of Cell Nucleus

Constituents of a Cell:

- ❑ **Cell Organelles:** Organelles are observed in Eukaryotic Cells which have definite shape of nucleus, Cell Organelles use membrane to distinguish their functions from the rest of the Organelles Example of Cell Organelles : Mitochondria, Golgi Apparatus, Ribosome etc...
- ❑ **Endocytosis:** The process of engulfing matter by a living cell to be utilized for the energy-using process. Amoeba uses this process for processing of food
- ❑ Substances like CO₂ and Oxygen move through the cell membrane by a process called **Diffusion**.
- ❑ **Osmosis** is the process of movement of molecules through a semi-permeable membrane into a region of higher solute concentration in the direction that tends to equalize the solute concentration on both the sides.
- ❑ **Water** molecules are transported through the cell membrane by this process of Osmosis
- ❑ **Osmosis** is a case of **Diffusion** (through a semi-permeable membrane)
- ❑ **Protein and Fat** help in building the cell membrane which is known as cell biogenesis

- ❑ The Fluid in a cell excluding the Nucleus containing Organ Cells that perform specific functions of the cell is called Cytoplasm
- ❑ The cell organelle which combines simple molecules into complex molecules and packages them into vesicles and sends them out of the cell is called Golgi Apparatus
- ❑ Digestion of any foreign material is done by **lysosomes** to keep the cell clean, in one way it is the waste disposal system of the cell.
- ❑ The Power House of the cell – Mitochondria, energy required for various cell processes is released by Mitochondria through ATP (Adenosine-tri-Phosphate) molecules
- ❑ **ATP (Adenosine-tri-Phosphate)** is referred to as the Energy Currency of the cell
- ❑ The **Cell Division** is initiated by the Centrioles
- ❑ **Chromosomes** carry all the information that is required by the cell to grow, divide and reproduce
- ❑ The cell organelles which are found only in plants are Plastids

Leucoplasts	Chloroplasts
Protein, Starch and Oil are stored in Leucoplasts	Primarily for imparting colors to fruits and flowers. Chloroplast contain chlorophyll which is the site of Photosynthesis in Plants

- ❑ Large network of membrane bound tubes similar in structure to Plasma Membrane where Proteins, Fat Molecules are manufactured is called Endoplasmic Reticulum (ER), There are two types of Endoplasmic reticulum

Smooth Endoplasmic Reticulum	Rough Endoplasmic Reticulum
Helps in manufacturing of Fat Molecules or Lipids	Helps in manufacturing of Proteins
These lipids and proteins are used as Hormones and Enzymes in the body	
One Major use of ER is detoxification of many poisons and drugs is liver cells of Animals	
ER is both a manufacturer and a passage way for Intracellular transport	

- ❑ The process in which water is purified in the cell by removing the impurities when it flows from a dilute solution (hypotonic) to a concentrated solution(hypertonic) through a semi permeable membrane is called **Reverse Osmosis**. In this process, little pressure is applied to overcome the Osmotic Process
- ❑ The Non-Living Part Cell Organelles of the Cell are Vacuoles and Granules

Granules	Vacuoles
Stores – Fat, Proteins and Carbohydrates.	Stores – Excess Water, Minerals, Pigments and Waste Products
Not supported by any membrane	Fluid filled spaces enclosed by Membranes

- ❑ The Brain of the Cell – Cell Nucleus which control the different processes in the cell

Cell Nucleus consists of the following main parts			
Nuclear Envelope	Chromosomes	Nucleolus	Chromatin
Membrane similar to cell membrane covering the Nucleus	<ul style="list-style-type: none"> ❖ Chromosomes are the ones which carry information. ❖ They are made up of DNA and similar pattern of DNA is called Gene ❖ A Human-Being Usually has 23 Pairs of Chromosomes or (46 Chromosomes) 	<p>A small dense spherical structure in the nucleus of a cell</p> <p>Proteins are stored by the nucleolus</p>	<p>The DNA in the cell nucleus is packaged by special proteins called histones. The protein/DNA complex formed is called Chromatin</p>

- There are two types of process in cell division

<p>Mitosis</p>	<p>Simplest Duplication of a cell and all its parts. Five Steps are involved in the process Prophase, Metaphase, Anaphase, Telophase and Interphase</p>
<p>Meiosis</p>	<p>Four Cells are formed from the process of Meiosis during reproduction. It can be looked at as two simultaneous phases of Mitosis creating four cells from one original cell</p>

- On the Basis of functions performed by different tissues, they are classified into

<p>Epithelial Tissue</p>	<ul style="list-style-type: none"> - Covering or Protective tissues from Mechanical Injuries and Invading Micro organisms - These tissues are tightly packed and form a continuous sheet - The intercellular spaces in these tissue is negligible - Cells of epithelium play a crucial role in exchange of materials between the body and the external environment - The main function of the SQUAMOUS is to protect the parts from injury, germs etc is found mainly in the walls of blood vessels and air sacs of
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	lungs
Connective Tissue	Most abundant and widely distributed tissues in the animal body There are four types of connective tissues : Areolar, Adipose, Skeletal, Fluid
Muscular Tissue	Muscle Tissues are of three types: Skeletal(Voluntary), Smooth(Involuntary) and Cardiac(Involuntary)
Nervous Tissue	This tissue is the major tissue in the body which controls the body responsiveness to changing conditions The Brain, Nerves and Spinal Cord compose of the nervous tissue Each neuron has a single long part, called the axon, and many short, branched parts called dendrites.

- ❑ Endocrine is a collection of gland which secrete certain chemical messages called hormones
- ❑ Endocrine glands lack ducts and are also called as ductless glands
- ❑ Different endocrine glands present in the human body are

Pituitary	Located in a bone cavity called sella tursica Secretes : Growth Hormone Prolactin
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	TSH – Thyroid Stimulating Hormone
Pineal	<p>Located on the dorsal side of the forebrain</p> <p>Secretes :</p> <p>Melatonin – Helps in maintaining the Sleep-Wake cycle , Body Temperature etc...</p>
Adrenal	<p>Located at the anterior part of each kidney</p> <p>Comprises of two tissues:</p> <p>Adrenal Medulla – secretes adrenaline and noradrenaline which are rapidly released in case of stress which are commonly called as Hormones of Fight, these hormones are also responsible for increase in concentration of glucose in Blood and Adrenal Cortex – secretes many hormones called Corticoids</p>
Thyroid	<p>Located on either side of Trachea</p> <p>Secretes :</p> <p>T4 – Throxine</p> <p>T3 – Triiodothyronine</p> <p>Iodine is essential for the synthesis of Hormone in Thyroid Gland</p> <p>Deficiency of Iodine causes Hypothyroidism and enlargement of gland known as Goiter</p> <p>Thyroid hormone also assist in formation of Red Blood Cells,</p>

	Metabolism, Water and Electrolyte Balance and calcium levels in Blood
Pancreas	<p>Pancreas is a composite gland containing exocrine and endocrine system</p> <p>Contain Millions of Islets of Langerhans which contain</p> <p>a-cells – which secrete Glucagon and</p> <p>p-cells – which secrete Insulin</p>
Parathyroid	<p>Present on the Backside of the Thyroid Gland</p> <p>Secretes : Parathyroid Hormone (PTH) which increases the calcium levels in the blood</p>
Thymus	<p>Located behind the Lungs on the ventral side of oarta</p> <p>Secretes : Thymosins</p> <p>Plays a major role in the development of Immune System</p>
Gonads	Consists of important parts TESTIS and OVARY

HORMONES

- Hormones are classified into three types based on their structure

Steroids	These are lipids derived from Cholesterol. These are secreted by Gonads, Adrenal, Cortex and
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	Placenta
Peptides	Majority of the hormones are peptides, they are characterized by short chain of amino acids and are secreted by Pituitary, Parathyroid, Heart, Stomach, Liver and Kidneys
Amines	These are derived from amino acid tyrosine and are secreted from Thyroid gland and adrenal medulla

- ❑ Antagonism is the paired process of contraction and simultaneous expansion of various muscles in the body
- ❑ Immunity is the body's ability to repel foreign substances and cells
- ❑ Cell Wall is absent in Animals
- ❑ Cells in an animal burst when surrounded by Hypertonic medium
- ❑ Cells in Plant doesn't burst when surrounded by Hypertonic Medium due to the presence of Cell Wall
- ❑ Lysosomes are also called the Suicidal Bags of a cell
- ❑ Water constitutes the major component of the cell
- ❑ The chemical process that occurs in a living organism to continue life is called Metabolism
- ❑ Carbohydrates are the important biomolecules that are a major part of the living organisms. They are also called as the Hydrates of Carbon and are primarily produced by Plants

Some Important Carbohydrates	
Sucrose	Commonly used sugar in day to day life is a disaccharide which on hydrolysis gives glucose and fructose
Lactose	Carbohydrate present in Milk
Glucose	It is a monosaccharides, it can be hydrolyzed further into simpler unit

	aldehyde or Ketone Present mainly in sweet fruits, ripe grapes, Honey etc
Fructose	
Ribose	It forms the basic backbone of RNA
Galactose	It is a monosaccharide obtained by hydrolysis of Lactose with the help of enzyme Lactase
Starch	It is a poly saccharide and is most commonly found carbohydrate in nature, it acts a storage material in plants and is an important dietary source for humans
Cellulose	Found as abundant organic substance in Plants
Glycogen	Similar characteristic of starch, stores carbohydrates in Animals mainly in liver and muscles

- ❑ All proteins are polymers of Amino Acids
- ❑ Proteins synthesized in the body are called non-essential amino acids
- ❑ Proteins obtained through diet are called essential amino acids
- ❑ Proteins soluble in water are called Globular Proteins Ex: Insulin
- ❑ Proteins not soluble in water are called Fibrous Proteins Ex: Keratin
- ❑ Vitamins are organic compound required by the body to perform biological functions for growth and maintenance of the Organism
- ❑ Vitamins are general classified as

Fat Soluble Vitamins	Water Soluble Vitamins
Soluble in Fat and Oils but insoluble in water, they are stored in liver	Soluble only in water

Vitamin : A,D,EK

Vitamin : B and C

- ❑ The in-organic nutrients called as Minerals which are equally essential for the human body in small traces are

Calcium	Potassium	Magnesium	Sodium	Copper	Iodine
Iron	Manganese	Zinc	Selenium		

- ❑ Fat – one of the three main macronutrients is also known as triglycerides which are esters of three fatty acid chains and alcohol glycerol
- ❑ Cholesterol and triglycerides are lipids, which are insoluble in water but soluble in alcohol
- ❑ The Blood Pressure is controlled by Adrenal Gland
- ❑ Any enzyme that converts proteins into peptides is called protease

Micro Organism	Disease caused by the Micro Organism	Organism effected	Mode of Transmission
Fungi	Ringworm	Human	Skin Contact
Protozoan	Malaria	Human	Female Anopheles Mosquito
AIDS	Human Immuno Deficiency Virus	Humans	Blood exchange
Anthrax	Bacillus Anthracis	Mostly Animals including Humans	Infected Meat
Cholera	Vibrio Cholerae	Humans	Water / Food
Diphtheria	Bacterium Diphtheriae	Humans	Air/ Direct contact
Pneumonia	Streptococcus Pneumoniae	Humans	Airborne droplets of sneeze

Plague	Yersinia Pestis	Human	Air/ Direct Contact
Tuberculosis	Mycobacterium	Humans	Air
Chicken Pox	Varicella Zoster Virus	Humans	Air
Cold, Influenza	Rhino Virus	Humans	Airborne
Dengue Fever	Flavivirus	Humans	Female Aedes Mosquito
Ebola	Ebola Virus	Humans	Animal to Human
Foot and Mouth Disease	Picornavirus	Animals	Animal to Animal
Amoebiasis	Entamoeba histolytica	Humans	Contaminated Water

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