

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ
وَقُلْ رَبِّ زِدْنِي عِلْمًا



EDUCATION WITH HAMZA

SUBJECT:

Biology

CLASS:

9th

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Education with Hamza

وَقُلْ رَبِّ زِدْنِي عِلْمًا

DEDICATED TO

تمام تعریفیں رب لاشریک کے لئے جس نے مجھ ناپیز کو پیدا کیا۔ اور لاکھوں کروڑوں درود اس ذات پر جس نے ہماری بخشش کے لئے رورو کر دیا مانگی۔ ان نوٹس کو امت محمدیہ کی آسانی کے لئے بنایا گیا ہے۔ ان کا ثواب رب موسیٰ و ہارون نبی آخر زماں علیہ السلام کی جملہ آل و اولاد اور امت کو عطا کرے آمین۔

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Chapter no 01-

Introduction to Biology

1) Define biology? Difference b/w botany, zoology, and microbiology?

Biology comes from the Greek words: bios meaning life and logos meaning study. It is about studying all living things, from tiny bacteria to big whales. Lamarck was the first to use the word "Biology".

* **Botany:** Botany refers to the scientific study of plants including their structure, growth, reproduction and classification. The term originates from the Greek word "botane" meaning plant and Logos meaning "study".

* **Zoology:** Zoology is the scientific study of the animals, including their behaviour, structure, classification and distribution. The terms word "zoon" meaning animals and logos meaning "study".

* **Microbiology:** Microbiology is the study of microorganisms which are living things that are too small to be seen with naked eyes.

2) Difference b/w cytology, Embryology and Genetics?

* **Cytology:** Cytology also known as cell biology is the study of cells. Cytologists examine the structure, function and development of cells.

* **Embryology:** Embryology is the study of the development of an organisms from a fertilized egg to a complete individuals. Embryologist focus on the various stages of this development.

* **Genetics:** The study of the gene and heredity in organisms is known as genetics. The study of genetics focus on the inheritance of qualities from parents to off spring.

3) Define pathology? Difference b/w marine biology and molecular biology?

* **Pathology:** Pathology is the study and diagnosis of diseases. Pathology helps to study the causes of a diseases and the effect that are associated with the development of diseases. A pathologist, for instance, investigates the causes of cancer.

* **Marine Biology:** The study of the life in the oceans is called marine biology for example:- whales, dolphins, fishes etc.

* **Molecular Biology:** The study of the molecules that comprise living organisms is known as molecular biology. For example:- A molecular biologist studies the structure of DNA, such as how the base pairs are arranged and how the DNA molecule is coiled.

4) Define Anatomy? Difference b/w morphology and Histology?

* **Anatomy:** Anatomy is the branch of biology concerned with the study of the internal structure of organisms. The word anatomy comes from the Greek word "anatome" where "ana" means "up" and "tome" means "cut".

* **Morphology:** Morphology is the study of the form and external features of an organisms. Morphologists study the external features of the organisms, such as body shape, size, colours, etc.

* **Histology:** Histology is the study of tissues. Histologists study the structure and functions of tissues. For example:- study the different types of connective tissue is an example of histology.

5) Define pharmacology? Difference b/w physiology and Taxonomy?

* **Pharmacology:** Pharmacology is the study of the drugs. Pharmacologists study the effect of the drugs on living things and development of drugs.

* **Physiology:** The study of the functions of various parts of living things is called physiology. For example: studying how the heart pumps blood is an example of physiology.

* **Taxonomy:** The study of the classifications of organisms. Taxonomists classify the organisms based on their shared characteristics. For example:- A taxonomist classifies the species of plants or animals such as how they are related to other species.

6) What is plasmid DNA? What is computational biology?

* **Plasmid DNA:** Plasmid DNA is a small, circular double-stranded DNA molecule that exists separately from a cell's main chromosomal DNA, commonly found in bacteria.

* **Computational biology:** Computational biology is an interdisciplinary field that uses computer science, mathematics, and statistics, to analyze and model complex biological systems.

7) What is Bt. cotton and mars rovers?

* **Bt. cotton:** Bt. cotton is a genetically modified (GM) pest-resistant cotton plant variety that produces an insecticide to combat bollworms and other caterpillar pests.

* **Mars Rovers:** Mars Rovers are robotics vehicles used for space explorations. But, "Mars Rovers" is not a specific widely recognized term in this context. It is likely a misspelling or informal term for a Mars rover such as the Perseverance or Curiosity rovers.

8) Define climate change research and human genome project?

* **Climate change research:** Climate change research is the scientific study of long-term shifts in global weather patterns and temperatures, their causes (primarily human activities like burning of fossil fuels) impact on natural and human systems and strategies for mitigation and adaptation.

* **Human genome project (HGP):** The Human genome project (HGP) was an international, collaborative research program aimed at determining, storing and making publicly available the complete DNA sequence of the entire human genome.

9) On which principles scientific method based on? How biology check the results of experiment?

The scientific method based on principles of empiricism (observation and evidence), objectivity (detachment from personal bias) and falsifiability (the ability for a hypothesis to be disproven).

In Biology, the result of an experiment is not a mathematical calculation to be checked in a vacuum; rather, it is a prediction from a mathematical model that is validated by comparing it with real world experimental and observations.

10) Difference b/w Hypothesis, theory and law?

* **Hypothesis:** A tentative testable explanation for observation or set of observation.

* **Theory:** A well substantiated comprehensive explanation of some aspects of the natural world that has been repeatedly tested and confirmed.

* **Law:** A scientific law is a universal statement that tells us how things always happen in nature, often written with mathematical expression. Laws do not explain why things happen; laws act as foundational truths in science upon which theories and hypothesis are built.

11) Define computational biology?

Computational biology used computers to organize and analyze vast amount of genetic information, making it possible to fully understand human chromosome 22, the first chromosomes to be fully sequenced. This important step in 1999 helped scientists learn more about human DNA.

12) Define climate change research and the world of renewable energy?

* **Climate Change Research:** Understanding global climate change is about more than just temperatures. It involves learning from oceanographers who study the oceans, meteorologist who study the weather, biologists who look at living things and sociologists who understand how people's action affect the environments.

***The world of Renewable Energy:** Renewable Energy not only deals with just putting solar panels on roofs. It includes physicists working on the best ways to use sunlight, engineers making system to store energy, environmental scientists checking how these technologies affect nature, and economists looking at the costs and benefits for people.

13) Define scientific methods?

Scientific methods based on two key principles. Firstly, everything that happens in nature is caused by natural reasons. Secondly, the fundamental laws of nature are consistent everywhere and at every moment, which is known as the principle of uniformity.

14) How is inductive reasoning different from deductive reasoning?

Inductive reasoning moves from specific observations to a broader probable generalization, while deductive reasoning moves from a general rule to a specific guaranteed conclusion.

15) Why is biology considered a natural science?

Biology is a natural science because it is the systematic study of living organisms and their relationship to the natural world.

16) How biology check the result of an experiment?

Biologists often check the results of an experiments by using their senses, like seeing or listening. To see very microscopic objects or hear very soft sounds they use tools like microscope for seeing and microphone for listening, which help them collect more information.

Chapter no 02

Cellular Organization

17) Define tissue? Difference b/w epithelial tissue, connective Tissue and nervous tissue?

- * **Epithelial Tissue:** which forms protective barrier.
- * **Connective tissue:** which supports connects and bind other tissue.
- * **Nervous tissue:** which transmits signals throughout the body.

18) Define meristematic tissue? Difference b/w ground tissue, epidermal tissue and vascular Tissue?

- * **Meristematic tissue:** Meristematic tissue responsible for growth.
- * **Ground tissues:** involves in the photosynthesis (mesophyll tissue), provides support and helps store nutrients.
- * **Epidermal tissue:** offering protection from the external environment.
- * **Vascular tissue:** Ensuring the transport of water and nutrients.

19) Difference b/w organ and organ system?

- * **Organ:** Tissues are organized into groups to perform specific or related functions in an organisms, forming an organ.
- * **Organ system:** When different organs perform related function they form an organ system.

20) Difference b/w cuticle, guard cells and stomata?

- * **Cuticle:** The upper epidermis is covered by a waxy substance is called cuticle.
- * **Guard cell:** The lower epidermis contains bean-shaped cells known as guard cells.
- * **Stomata:** Guard cells surround and regulate tiny opening called stomata.

21) Difference b/w xylem and phloem?

- * **Xylem:** The xylem in leaves plays a crucial role in supplying water and minerals absorbed by the roots to the leaf tissues for photosynthesis and other metabolic process.
- * **Phloem:** On the other hand, the phloem carries the sugars produced during photosynthesis from the leaves (source) to different parts (sink) of the plant.

22) Difference b/w fibrous root and taproots?

- * **Fibrous root:** which are a network of roots all about the same size.
- * **Taproot:** which have a single dominant root with smaller lateral root.

23) Difference b/w sepal, petal, stamens and carpel?

- * **Sepal:** Sepal form the outermost layer usually green in colour and protect the flowers buds.
- * **Petal:** While petals are brightly coloured and fragrant, attracting pollinators.
- * **Stamen:** Stamens are the male reproductive structures.
- * **Carpel:** Carpels are the female reproductive structure of the flower.

24) Difference b/w circulatory system, immune system and Nervous system?

- * **Circulatory system:** The digestive system not only processes food but also works with the circulatory system to send nutrient to all cells.
- * **Immune system:** The immune system works hand in hand with the digestive system to fight off germs from the food we eat to keep us healthy.
- * **Nervous system:** The nervous system help by signalling when we are hungry and managing digestion, making sure our system works.

25) Difference b/w integumentary system, skeletal system and muscular system?

- * **Integumentary system:** The integumentary system consists of the skin, hair, nails, sweat glands.
- * **Skeletal system:** The skeletal system consists of bones, cartilage, joints and ligaments. It provides a frame that helps the body maintain its shape, protect vital organs and enable us to move.
- * **Muscular system:** muscular system consists of three types of muscles: skeletal, smooth, and cardiac muscle. It help us movement of the body part.

26) Difference b/w sebaceous glands and sweat gland?

Sebaceous glands: The dermis contains the blood vessel, nerves, hair, follicles, sweat glands and sebaceous glands.

Sweat glands Sweat gland's help regulate body temperatures by producing sweat and sebaceous glands produce oil to keep the skin and hair moisturized.

27) Difference b/w Ligaments and tendos? Define Joints?

Ligaments: Ligaments are strong bands that holds bones together at joints.

Tendons: Tendons are strong connective tissue band that attach skeletal muscles to bones.

Joints: Joints are the points where two or more bones meet, allowing movement.

28) Difference b/w cardiac and smooth muscle? Define acne?

Cardiac muscle: Cardiac muscle is also involuntary and is found only in the heart. It helps pump blood throughout the body.

Smooth muscle: Smooth muscle are found in organs like the stomach, aiding the digestion.

Acne: Acne is a skin problem where hair follicles get blocked with oil and dead skin cells, leading to pimples, blackheads or white heads often on the face chest and upper back

29) Define Nerves? Difference b/w neurons and neuroglia?

Nerve: Nerve are made up of bundles of nerve fibers that carry messages from the brain to different body part and back to the brain.

Neurons: Neurons are special cells that send these messages using electrical and chemical signals.

Neuroglia: Neuroglia are helper cells that protect and support neurons.

30) Define blood? Difference b/w arteries, veins and capillaries?

Blood: Blood composed of red and white blood cells, platelets and plasma, carries these substances throughout the body. This system is vital for maintaining the body's homeostasis and overall health.

Arteries: The heart, a four-chambered organ, pumps blood which travels through the arteries.

Veins: To reach all parts of the body and then returns to the heart through veins.

Capillaries: Microscopic blood vessels called capillaries connect arteries and veins, allowing the exchange of oxygen, nutrients and waste products between blood and tissues.

31) Define kidney? Difference b/w ureters, urinary bladder, and urethra?

Kidney: The kidney filter the blood to produce urine, which then passes through the ureters and gets stored in the urinary bladder.

Ureters: The duct by which urine passes from the kidney to the bladder or cloaca.

Urinary bladder: urinary bladder is a hollow muscular organ in the pelvis that acts as a temporary reservoir for urine before it is eliminated from the body.

Urethra: The duct by which urine is conveyed out of the body from the bladder, and which in male vertebrates also conveys semen.

32) Define homeostasis? Difference b/w osmoregulation and thermoregulation?

Homeostasis: Homeostasis derived from Greek word meaning "similar and steady," is the process by which living organisms maintain a stable internal environment despite changes in the external surroundings.

Osmoregulation: The process of regulating water and electrolytes in the body is known as osmoregulation.

Thermoregulation: The maintenance of a steady internal body temperature is known as thermoregulation.

33) Define insulin? Difference b/w beta and alpha cell?

It releases insulin to lower high glucose level and glucagon to raise low levels, maintaining a blood glucose level, with in the range of 70 to 100mg/dl.

Beta and Alpha: There are two types of cell in the pancreas linked with the glucose regulation; beta and alpha cells. Beta cells release insulin to lower high glucose levels while alpha cells release glucagon to raise low glucose levels.

Chapter no 03.

Cell structure

34) Define historical perspective of cell and discoveries of some after scientists?

In 1665, Robert Hooke from England used a simple microscope to examine a piece of cork. He saw tiny room-like structure called them "cells." It was the start of the significant scientific discovery,

showing us that all the living organism are made of cells the basic buildings blocks of life.

In 1674, Anton van Leeuwenhoek: improved the microscope and was the first to see Living cells like bacteria from pond water.

In 1831, Robert Brown: found the nucleus in plant cells while looking at orchids.

In 1838, Matthias Schleiden: discovered that all plants have cells.

In 1839, Theoder Schwarm: realized that animals also have cells.

In 1855, Rudolf Virchow: recorded that new cells come from pre-existing cells, disputing the idea that cells could arise spontaneously.

35) Write any four difference in Prokaryotic cell and Eukaryotic cells?

Prokaryotic cells	Eukaryotic cells
These are the primitive and simple cells	These cells have a true nucleus keeping their DNA inside the nuclear membrane.
The name prokaryote comes from the greek word "pro" meaning "before" and "karyone" meaning "nucleus"	Eukaryotic cells get their name from the greek word "eu" meaning "true" and "karyon" meaning "nucleus"
They do not a true nucleus instead their nuclear material DNA is openly found in an area of cytoplasm called nucleoid.	They are more complex and have different membrane bounded organelles, like mitochondria and golgi apparatus each doing specific function
Prokaryote do not have membrane bound organelles like endoplasmic reticulum or mitochondria and are usually smaller than the eukaryotic cells.	They are usually larger than the prokaryotic cells,

36) Define organelles?

Cells are made up of different structures that do specific and functions and these structures are called organelles.

37) Difference b/w cellulose and Lignin?

Cellulose: The primary material in the cell wall is cellulose.

Lignin: As the cell grows, a thicker secondary wall forms inside the primary one making it stronger with substances called lignin.

38) Define fluid mosaic model?

According to the fluid mosaic model it is a lipid bilayer in which proteins are embedded. This model shows that the membrane is flexible. The lipids give the membrane its fluid character, and the proteins have different functions, like moving things across the membrane. There are also carbohydrates attached to the proteins and lipids, which help the cell recognize other cells. Cholesterol in the cell membrane of eukaryotes provides stability to the membrane.

39) How are some proteins used?

Some proteins in the cell membrane serve as important markers for the immune system, labeling cells as "self" meaning they belong to the organism.

Thus, the immune system can identify cells that lack these proteins, as foreign likely pathogens (diseases causing organisms or viruses).

40) Difference between cytoplasm and mitochondria? Write its functions also?

Cytoplasm: The cytoplasm is a semifluid structure and substance filling the space inside a cell. It is made up of water, salts, and organic molecules. These molecules are important energy reserves and help build cell components and perform many cellular activities. The cytoplasm is a place where organelles perform their functions.

Mitochondria: Mitochondria are often called the "power house" of the cell because they make energy. They have different shapes but are usually oval and are double-membrane bounded.

The outer membrane is smooth while the inner membrane has folds called the cristae. The primary function of the mitochondria is to make (ATP), which is like the cell's energy currency.

41) Difference between anucleate and multinucleate cells?

Anucleate: Some cells do not have a nucleus, like mature red blood cells in humans and they are termed anucleate.

Multinucleate: On the other hand, certain cells like the skeletal muscle cell have multiple nuclei and are called multinucleate.

42) Define ER and SER?

(ER) Endoplasmic Reticulum: The (ER) is an extensive interconnected network of membranes that extend from the cell membrane to the nuclear envelope.

(SER) Smooth Endoplasmic: The (SER) which does not have ribosomes and appears smooth. The smooth endoplasmic reticulum helps make lipids and detoxify harmful substances.

43) Difference between Golgi apparatus and Ribosomes?

Golgi Apparatus: Golgi apparatus was discovered by Camillo golgi in 1898. It is found in eukaryotic cells and is made up of layers of flattened sacs called cisterane.

Ribosomes: Ribosomes are tiny-grain like structure in cells. They either freely float in the cytoplasm or be attached to the endoplasmic reticulum. Ribosomes are composed of protein and ribosomal and are not surround by a membrane.

44) Difference b/w Lysosomes and centrioles and write its functions?

Lysosomes: Lysosomes are like small recycling centers in cells, surrounded by a single membrane. They were found by a scientist named Christian de Duve, in the 1950s.

Lysosomes work by fusing with other vesicles in the cell that contain waste or food.

Centriole: Centrioles are hollow cylindrical structures inside animals cells and many unicellular organism but are usually absent in plant cells. Each cell has two centrioles, and they stand at right angles to each other. They are made up of special protein called tubulin.

45) Difference b/w vacuoles and cytoskeleton and write its functions?

Vacuoles: Vacuoles are fluid-filled organelles, found in the cells. They are storage spaces and are surrounded by a membrane called the tonoplast. They have different size. Animal cells usually have many small vacuoles for storing material and eliminating waste.

Cytoskeleton: The cytoskeleton is like a cell's skeleton, providing it support and shape. Its has three main component: microtubules, microfilaments, and intermediate filaments.

46) Difference b/w tonoplast, sap, and food vacuoles?

Tonoplast: They are storage spaces and surrounded by a membrane called the tonoplast.

Sap: This vacuole in plants is filled with a blend of water, ions, organic compounds and waste water called, sap.

Food vacuole: When vacuoles help disgesting nutrients, they are termed food vacuoles."

47) Define contractile vacuoles? Difference b/w micro-filaments and intermediate filaments?

Contractile vacuoles: In certain unicellular organisms a unique vacuole called contractile vacuoles, aids in osmoregulation and excretion by removing excess water and waste, respectively.

Microfilaments: are thin threads made of actin protein, They help the cell contract and changes its shape.

Intermediate filaments: formed of various proteins, offer strength and stability to the cell's structure.

48) Define cell specialization while its essential for multicellular organism?

Cell specialization: Cell specialization also known as cell differentiation, is the process during which generic cells. (see stem cell), transform into specific cells that have unique functions in the body. All cell in the multicellular organisms start from a single cell the zygote.

As this cell divides, the new cells activate or deactivate different parts of their DNA. This decides what proteins they make and what function they perform.

Chapter no 04

Cell Cycle

49) Define cell division? Differentiate b/w DNA replicate and chromatid?

Cell division is the fundamental biological process where a single parent cell splits to form two or more new "daughter" cells.

DNA replication: During the s phase, the cell copies its DNA, a process called DNA replication.

Chromatid: Each chromosomes makes an exact copy of itself called a chromatid.

50) Define mitosis? who first observed mitosis?

The cell division in which the parent cell divides to make two identical daughter cells with the same number of chromosome as in the parent cell is called mitosis.

Walther Flemming is the first observed mitosis - A german biologist, is credited with discovering and describing mitosis in detail in the early 1880s, coining the term from the Greek for "thread" to describe the chromosomal movements.

51) Define sister chromatids? Difference b/w centromere and kinetochores?

* **Sister chromatid:** Each chromosomes consist of two identical copies are called sister chromatids.

* **Centromere:** which are connected at a point called the centromere.

* **Kinetochores:** on the centromere, there is a disc-shaped structure called the kinetochores.

52) Define anaphase of mitosis? Difference b/w cytokinesis and metaphase plate?

In anaphase the spindle fibers contract towards their poles. It separate's the sister chromatids from the centromere and each separated chromatid is now a separate chromosome. These separated chromosomes now move along the spindle fibers towards their respective poles.

* **Cytokinesis:** After the nucleus divide, the next step is to split the cytoplasm, which completes the cell cycle. This is called cytokinesis.

* **Metaphase plate:** The spindle fibers align the chromosome in the centre of the cell, forming the metaphase plate.

53) Difference b/w cell plate and phragmoplast?

* **Cell plate:** Plant cells have a rigid cell wall, so cytokinesis is different in them. Instead of pinching in, as in animal cells, plant cells form a cell plate.

* **Phragmoplast:** phragmoplast is the structure that gives rise to the cell plate in plants. Therefore, the formation and growth of the cell plate are dependent on the phragmoplast.

54) Difference b/w sister and non-sister chromatids?

* **Sister chromatids:** Each chromosomes consist of two genetically identical are called sister chromatids.

* **Non-sister chromatid:** Joined at the centromere, while the chromatids of two homologous chromosomes are referred to as non-sister chromatid.

55) Define synapsis? Difference b/w crossing over and chiasmata?

* **Synapsis:** Pairs of similar chromosomes called homologous chromosomes line up in a process called synapsis.

* **Crossing over:** A key event in the prophase I is crossing over, where the non-sister chromatids exchange segments of genetic material which increases genetic diversity.

* **Chiasmata:** The points where this exchange occurs are called chiasmata.

56) How does cytokinesis is differ from the animals and plants cells?

* Cytokinesis occurs differently in the animals and plant cells. In the animals cell a cleavage furrow forms. It is a small groove in the cell membrane that pinches inwards. The groove gets deeper and deeper until it reaches the middle of the cell and divides into two new cells.

57) Name two events in the meiosis responsible for creating genetic diversity?

* It ensures the formation of genetically unique gametes contributing to diversity and evolutionary adaptation.

* One of the primary significances of meiosis is the formation of gametes (sperm and egg) which is essential for sexual reproduction.

Chapter no 05

Biomolecules

58) Define biomolecules? Difference b/w organic and inorganic biomolecules?

* **Biomolecules:** Biomolecules are the biological molecules are important for life and it have two main types. Organic and inorganic biomolecules.

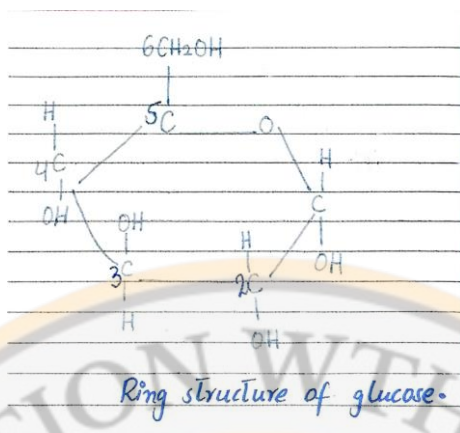
* **Organic biomolecules:** Organic biomolecules are carbon based and often bond with hydrogen and other element.

* **Inorganic biomolecules:** Inorganic biomolecules usually come from environment and are simpler.

59) What are carbohydrates? Define glucose and its structure?

* **Carbohydrates:** Carbohydrates are organic molecules primarily composed of carbon, hydrogen, and oxygen. These elements typically combine in such a way that hydrogen and oxygen are present in a 2:1 ratio as in water (H₂O).

* **Glucose:** Glucose is a primary crucial monosaccharides. Glucose is a hexose sugar, means that it's consist of six carbon atom. Its chemical formula is $C_6H_{12}O_6$. It forms a cyclic structure in a aqueous solution resembling a hexagon.



60) Difference b/w oligosaccharides and disaccharide?

* **Oligosaccharides:** Oligosaccharide are the type of carbohydrates that falls between monosaccharides and polysaccharides in term of number of monomers. The most common oligosaccharides are disaccharide.

* **Disaccharides:** Disaccharides are formed when two monosaccharides molecules bond Together. The bond formed between two monosaccharides is called a glycosidic linkage. They can be broken down into monosaccharide upon hydrolysis. They also taste sweet. A common example is sucrose.

61) Define the following? Starch, Amylase, amylopectin, glycogen, cellulose?

* **Starch:** Starch is a polysaccharide made up of numerous glucose unit. It is primary energy storage molecule in plants.

* **Amylose:** Amylose is a linear polymer of glucose molecule.

* **Amylopectin:** while amylopectin is a branched polymer of glucose molecules.

* **Glycogen:** Glycogen is also composed of glucose units. However, it highly branched and more complex. Glycogen is the main storage form of glucose in animals, primarily in liver and muscle cells.

* **Cellulose:** Cellulose is also a polymer of glucose, but it's bond arrangement differ from starch and glycogen.

62) What is the role of the source of carbohydrate?

* Carbohydrates perform multiple functions in living organism. They are the main source of energy. Once consumed, carbohydrates break down into glucose which cells utilize for immediate energy.

63) Define Acylglycerols? Difference b/w glycerol and triacylglycerol?

Acylglycerols are compounds composed of two smaller molecules, glycerols and fatty acids.

* **Glycerol:** Glycerol is the three carbon alcohol with a hydroxyl group on each carbon.

* **Triacylglycerol:** The most common type of acylglycerol found in nature is triacylglycerol also known as triglyceride.

64) Define fatty acid? Difference b/w saturated and unsaturated fatty acid?

* **Fatty acid:** Fatty acid have a long carbon skeleton containing a carboxyl group and a long hydrocarbon chain attached to it.

* **Saturated and unsaturated fatty acids:** Fatty acids in triglycerides can be either saturated or unsaturated. A fatty acid is considered saturated if there are no double bonds between the carbon atom of its chain. On the other hand an unsaturated fatty acid has one or more double bonds, forming by the removal of hydrogen atoms from the carbon skeleton.

65) What is phospholipid? Write the role and source of Lipid?

* **Phospholipid:** Phospholipid are the type of lipid that are structurally similar to triglycerides. However, instead of having three fatty acids attached to a glycerol molecule, they have only two.

* **Source of lipid:** Lipids serve vital functions in the body notably through triglycerides which store energy more efficiently than carbohydrates and proteins, offering a rich source of energy reserves.

66) What is manage triglycerides and cholesterol?

* **Manage Triglycerides:** The gut microbiome consisting of trillions of bacteria and other microorganism in our digestive tract help manage triglyceride.

* **Cholesterol:** Cholesterol is another type of lipid that is important for the proper functioning of the body. It is found in animal-based food such as meat, egg and dairy products. Our bodies need cholesterol, however too much of it can lead to health problems such as heart disease.

67) Define protein? Difference b/w peptide and polypeptide?

* **Protein:** Proteins are essential molecules that plays a significant role in almost every process within living organism. They are distinct from carbohydrates and lipid because they contain nitrogen, often sulphur in addition to carbon, hydrogen and oxygen.

* **Peptide and polypeptide:** When amino acid link together they form a bond known as peptide bond. Chains of amino acids linked by peptide bond are termed as polypeptides.

68) What is the role of source of protein?

* Proteins are present everywhere in the cell and are involved in every cellular process. In the cytoplasm they help in metabolism and support. In organelles like mitochondria, they are involved in energy production. Proteins plays various role in the body demonstrating their significance in complex activities of life. They work as enzymes to speed up reaction.

69) Define Amino acid? Difference b/w essential and non-essential amino acid?

* **Amino Acids:** Proteins are made up of smaller subunit called amino acid which are the building blocks of these biomolecules. Amino acid are linked together in specific sequences forming the vast array of proteins that are fundamental of life.

* **Essential and non-essential amino acids:** Essential amino acids are those amino acids that cannot be produced by the body and must be obtained from food. While non-essential amino acid are those amino acids that can be produced by the body.

➤ **So, they do not need to be obtained from food.**

70) Define nucleotides? Difference b/w DNA and RNA?

* **Nucleotide:** These strands are made of smaller units called nucleotide. Each nucleotide consist of three parts: a phosphate group, a pentose sugar molecule called deoxyribose and a nitrogenous base.

* **DNA:** DNA are responsible for carrying the genetic instruction for all known living organism and many viruses. Its unique structure and function make it central of life. DNA is structured as a double helix, resembling a twisted ladder. The nucleotides in DNA are called deoxyribonucleotides.

* **RNA:** RNA is a molecule that helps in reading the genetic information in DNA and translating it into proteins. RNA is a polymer composed of nucleotides. Nucleotides in RNA are called ribonucleotides which are linked by covalent bond similar to the nucleotides in DNA.

71) What is phosphodiester bond? Difference b/w purines and pyrimidines?

* **Phosphodiester:** The covalent bond between the two nucleotides in DNA and RNA is named phosphodiester.

* **Purines:** Purines have two rings structure and include adenine (A), guanine (G).

* **Pyrimidines:** Other hand pyrimidines have a single ring structure and include thymine (T), and cytosine (C).

72) What is the importance of RNA in protein synthesis?

RNA serves as the messenger in the process of transferring genetic instructions from DNA to the protein making sites. In the cell known as ribosomes. The process begin when a cell requires a particular protein First, the corresponding DNA segment is copied into messenger RNA (mRNA) in a process called transcription.

73) Difference b/w Amanatin and Tetracycline?

Amanations- Amanatin toxin occurs in the " death cap mushroom? Amanatin inhibits mRNA synthesis, making protein synthesis impossible.

Tetracycline: Tetracycline (antibiotics), binds to bacterial ribosomes. When its ribosomes are disrupted a cell cannot make protein and it dies.

74) Define central Dogma? Difference b/W transcription and translation?

Central Dogma: Central Dogma describes the flow of genetic information with in cells.

Transcriptions: It states that DNA serves as the template to synthesize mRNA through a process called transcription.

Translations: mRNA serves as the template for protein synthesis through a process called translation.

75) List three different roles that proteins play in the human body?

Proteins have diverse roles, including providing structure (muscle, bones, skin) acting as enzymes and catalysts to speed up bodily reactions and serving as transporters /storage or immune defenders (antibodies.)

76) Why are lipids essential for living organisms and what roles do they play in our bodies?

Lipids are essential to all living organisms as they provide the fundamental architecture for cells and serve as a vital energy reservoir.

77) What roles does haemoglobin play in the human body? How does RNA differ from DNA in terms of structure?

Hemoglobin, an iron-rich protein in red blood cells, acts as the body's primary oxygen transporter picking up oxygen in the lungs and delivering it to tissues while also helping to collect carbon dioxide and bringing it back to the lungs while also helping to maintain blood pH balance.

DNA is a stable double-stranded helix with deoxyribose sugar and Thymine (T), while RNA is a more reactive single-stranded molecule with ribose sugar and Uracil (U) instead of Thymine.

78) What are the two main processes involved in protein synthesis?

The two main processes in protein synthesis are transcription where DNA code is copied into messenger RNA (mRNA) in the nucleus and translation.

Chapter no 06

Enzymes

79) Difference between metabolism, catabolism and anabolism?

Metabolism: The set of all these chemical reactions which helps an organism to maintain life is collectively called metabolism.

Catabolism: Catabolism comes from the Greek word "katabole", which means "breaking down". It refers to the breakdown of large molecules into simpler ones. This often releases energy.

Anabolism: Anabolism comes from the Greek word "anabole" meaning building up." It refers to the synthesis of larger molecules from smaller ones and usually needs energy.

80) Difference between dehydrogenases and ribozymes?

Dehydrogenases Enzymes are usually named after the substrate they work on or the type of the reaction they assist. for example enzymes that work on proteins are called " proteases", and those that remove hydrogen are called " dehydrogenases.

Ribozymes While the most enzymes are protein, there is a notable exception in ribozymes.

81) Difference b/w intracellular and extracellular enzymes?

Intracellular Enzymes: Those that work inside the cells, like the ones in glycolysis are called intracellular enzymes.

Extracellular Enzymes: Other that work outside the cellry Like pepsin in the stomach are called extracellular enzymes.

82) Define prosthetic group? Difference b/w active site and binding site?

Prosthetic group: organic refactors that are permanently attached to the enzymes are called prosthetic group.

Active site: The active site is a region on the enzyme where a substrate binds. Its specific shape allows the enzyme and substrate to fit together, well.

Binding sites: A binding site is a specific region or pocket on a large molecule (like a protein, enzyme, or DNA) where another specific molecules called ligand. for examples drug, substrate, hormone, lon, or anti body attaches of ten causing a functional change crucial for biological processes and drug design.

83) Define multi enzyme complexes? Difference b/w inhibitor and cofactor?

Multi enzyme complexes: Often multi enzymes that catalyze various steps of a sequence of a reactions are grouped together in structures known as multi enzyme complexes.

Inhibitors: Some substances can slow down or stop the activity of enzymes called inhibitor.

Cofactors: Some enzyme require additional non-protein molecules called cofactor.

84 Difference b/ co-enzyme, apoenzymes, haloenzymes?

Co-enzymes: While those that are temporarily bound to the enzymes are known as co-enzymes.

Apoenzymes and Haloenzymes: Anapoenzyme is the inactive protein part of an enzyme while a haloenzyme is the complete fully active form, created when the apoenzyme binds with its necessary cofactor (like metal ion or coenzyme).

85) Define transition state? Difference b/ substrate and product?

Transition state: When the substrate binds with the enzyme enzyme temporary unstable condition known as the transition state.

Substrate and product: A substrate is a specific bstance on which an enzymes acts in a biochemical reaction while a product is a substance formed after the enzymes has worked on the substrate.

86) Difference b/w lock and key model? Define induced fit model?

Lock and key: The lock and key model, proposed by Emil Fischer in 1884, suggests that enzymes and substrates fit together perfectly like a key in a lock. According to this model active site is a rigid structure. It does not change during or after the reaction. This model explains the specificity of the enzyme, which is due to the exact shape of the active site that binds to a specific substrate.

Induced Fit model: The idea of lock and key model is oversimplified because it does not show how flexible these interactions are. So, in 1958, Daniel Koshland proposed the "induced fit" model. According to this model the enzyme active site is not rigid. When the substrate binds to the active site the enzyme adjusts its shape which allows it to fit around the substrate precisely, like a glove adjusting to a hand. This model of enzyme-substrate interaction is more widely accepted than the lock and key model.

87) Define enzyme and why they are necessary for the chemical reaction? What is meant by the specificity of enzyme? Give an example. What is the primary purpose of enzyme inhibition in cellular processes?

Enzymes are the biological catalysts that speed up specific chemical reactions in living things by lowering the activation energy needed for crucial processes like digestion and metabolism to happen fast enough for life, without being used up themselves.

Enzyme specificity is the ability of an enzyme to select and catalyze a reaction for a single specific substrate or a group of closely related molecules among many possible compounds. Examples: Urease only catalyzes the hydrolysis of urea; it will not act on chemically similar compounds like methyl urea.

The primary purpose of enzyme inhibition in cellular processes is to regulate metabolic pathways and maintain cellular homeostasis.

Chapter no 07

Bioenergetics

88) Define Bioenergetics? Difference b/w Autotrophs and Heterotrophs?

Bioenergetics: Bioenergetics is the study of energy flow and transformation in living organisms to support life. It explores how energy is converted and utilized in biological systems.

Autotrophs:- Autotrophs such as plants, algae, and certain bacteria produce their own nutrients through photosynthesis. They use sunlight to convert carbon dioxide into energy-rich compounds like glucose.

Heterotrophs: Heterotrophs obtain energy by consuming plants or other organisms that rely on plants for food. This chapter now explores energy flow through living systems highlighting the processes of energy capture, transformation and utilization.

89) Define adenosine triphosphate (ATP)? write three types of nucleotide also?

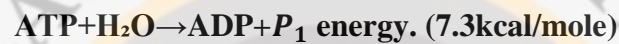
Living cells require a significant amount of energy to create and break the chemical bond. One molecule that is believed to be the universal energy carrier and supplier in all living cells is adenosine triphosphate (ATP)

Nucleotides are composed of three subunit molecules: a nucleobase, a five carbon sugar (ribose or deoxyribose) and a phosphate group consisting of one to three phosphates.

90) Who discovered ATP? and why it is energy currency of the cells?

ATP was discovered by Karl Lohmann in 1929, and its role as the cell's primary energy currency was established by Fritz Lipmann in 1941, earning him a Nobel Prize in 1953. ATP is sometimes described as energy currency for cells. Just like money is used to buy things, cells use ATP to perform different activities and reactions. When a cell needs energy, it changes ATP into ADP by breaking a bond between the second and third phosphate group of ATP molecules.

Reactions-



90) Describe the role of the chlorophyll in photosynthesis?

Chlorophyll's main role in photosynthesis is to act as a solar panel absorbing light energy from the sun and converting it into chemical energy which powers the plant to transform carbon dioxide and water into glucose and oxygen.

91) Define primary electron acceptor? which organism is responsible for photosynthesis?

The chlorophyll molecule absorbs sunlight and electrons in chlorophyll get excited. As a result, high-energy electrons are expelled from chlorophyll of a photosystem. These electrons are captured by a molecule called the primary electron acceptor.

The major organisms responsible for photosynthesis on land or terrestrial plants include trees, shrubs, herbs, and flowering plants, while phytoplankton are the primary photosynthetic organisms in aquatic environments such as oceans, lakes, and rivers.

92) Define Respiration? Difference b/w Aerobic and Anaerobic respiration?

Respiration is the vital process where living organisms convert nutrients into usable energy and release waste, involving gas exchange through breathing and cellular processes.

Aerobic and Anaerobic respiration:

Aerobic respiration is the process in which cells break down glucose to release energy (ATP) in the presence of oxygen. In contrast, when oxygen is scarce, cells undergo anaerobic respiration, which only includes glycolysis and results in less ATP production.

93: Define zymology? Difference b/w anaerobes and facultative?

Zymology The study of fermentation is known as zymology."

Anaerobes The organisms that can survive without oxygen are anaerobes."

Facultatives They can't survive in the presence of oxygen or facultative, meaning they can survive in both the presence and absence of oxygen."

94) Define fermentation? Difference b/ lactic acid and alcoholic fermentation?

Fermentation: Anaerobic respiration is also called the fermentation.

Lactic acid: lactic acid fermentation is the process used by some microorganism and our muscle cells, particularly during physical activity.

Alcoholic fermentations- Alcoholic fermentation is another form of anaerobic respiration, primarily used by yeast and certain types of bacteria.

95) How is the ATP produced in the electron transport chain?"

ATP produced in the electron transport chain through oxidative phosphorylation, where electrons from NADH and FADH₂ power proton (H⁺) pumping across the inner mitochondrial membrane creating a gradient it that drives the enzyme ATP synthase to convert ADP into ATP with oxygen serving as the final electron acceptor to form water.

96) List the input and output of the calvin cycle? list three cellular activities where ATPs utilized? what is the effect of light intensity on the rate of photosynthesis;

The calvin cycle uses CO₂, ATP, and NADPH as inputs to create sugar, ADP, and NADPH regenerating the cycle's starting molecule while producing the energy-rich carbohydrates needed for plant growth all occurring in the chloroplast stroma.

ATP Powers essential cellular activate like muscle contraction moving substance against concentration gradients-through active transport and building complex molecule via biosynthesis.

Light intensity directly increase the rate of photosynthesis up to a point as more light provide more energy for the light -dependent other factor and and reaction but eventually the rate plateaus because other factor like Co₂ or enzyme become limiting and extremely high intensities can even damage the photosynthetic machinery.

Chapter no 08

Plant Physiology

97) Define nutrients? Difference b/w macronutrients and micronutrients?"

Nutrients: A nutrients is a substance required by an organism to sustain life. It provides the necessary material for growth energy, repair and maintenance of body functions. Plant release oxygen produced during photosynthesis which is necessary nece. for the survival of living organisms.

Macronutrients: These are needed in Larger quantities and include nitrogen (N), phosphours (F), potassium (k), calcium (ca) sulfur () and magnesium (Mg).

Micronutrients: These are required in smaller quantities and include iron (Fe), boron (B), chlorine (CL), manganese (Mn), zinc (2n), and molybdenum (MO).

98) Define nitrogen fixation? Difference b/w Autotrophs and Heterotrophs?

Nitrogen Fixations: Plants primarily absorb nitrogen in the form of nitrates from the soil. These nitrates are produced through nitrogen Fixation.

Autotrophs: Autotrophs are organisms that can produce their own food from inorganic substances, typically through photosynthesis.

Heterotrophs: Heterotrophs are organisms that cannot synthesize their own food and rely on consuming other organism organic substances for energy and nutrients.

99) Define Chlorosis? How magnesium acts as a control component in chlorophyll molecules?

Chlorosis: Chlorosis is a condition where leaves fail to synthesize sufficient chlorophyll, leading to reduced photosynthesis and pale coloured leaves.

Magnesium acts as the control centre component of the chlorophyll molecule by serving as its core structural and functional element. It orchestrates the primary steps of photosynthesis through the following mechanism: structural backbone, photocapture, electronic stabilization, electron initiation, etc.

100) Write the role of the following nutrients?

Nutrients	Roles
Nitrogen	Essential for the synthesis of protein, chlorophyll and nucleic acid.
Magnesium	Integral part of chlorophyll also plays a role in enzyme activation and stabilizing the structure of nucleic acid
Potassium	Involved, in carbohydrate, metabolism, responsible for opening and closing of stomata
Calcium	Essential for plant cell division and growth, component of cell wall
Zinc	Necessary for chlorophyll production act as a cofactor for numerous enzymes.

101) Define composting? Difference b/w endodermis and pericycle?

Compositing:. Many people are making their own fertilizer through a technique called compositing.

Endodermis: This is a tightly packed layer of cells between the cortex and pericycle. It acts as a selective barrier, regulating the flow of substances into the conducting tissues.

Pericycles: The pericycle surrounds the vascular tissue (xylem and phloem). It plays an essential role in lateral root development and the formation of conducting tissues.

102) Difference b/w cortex and vascular bundles?

Cortex: Behind the epidermis lies the cortex. It consists of loosely packed cells that create a pathway for the movement of absorbed water and nutrients from the soil to the inner tissue layers of the root. In addition to transporting water and nutrients the cortex stores carbohydrates.

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Vascular bundles: Inner to the pericycle lies the vascular bundles, which contains the xylem and phloem. The xylem transport water and minerals from the root to the rest of the plant, while the phloem transports food and nutrients.

103) Difference b/w facilitated diffusing and active transport?

Facilitated Diffusion: Some minerals are carried from the soil to the epidermal cells of roots through their cell membrane by facilitated diffusion.

Active Transport: Active transport is the cellular process of moving molecules or ions across a cell membrane against the concentration gradient requiring, energy, usually from ATP and involving specific membrane proteins like pumps.

104) Difference b/w passive absorption and osmosis?

Passive Absorption: Passive absorption involves diffusion of water and minerals from soil to root through root hairs.

Osmosis: The movement of water molecules from a region of higher concentration to a region lower concentration through a selectively permeable membrane is called osmosis.

105) Difference b/w apoplast, symplast and vacular pathway?

Apoplast: Apoplast is the movement of water through adjacent Cell walls and intercellular spaces without entering in cytoplasm. until it reaches the casparian strips in the endodermis. **Symplast** **Symplast:** is water movement through the cytoplasmic junction between adjacent root cells allowing water to pass directly from one cell to another through their cytoplasmic Connection.

Vascular Pathways: Vascular pathways is the movement of water from vacule of one cell to vacule of another cell crossing the symplast pathway during the process."

106) Define ascent of sap? Write it mechanism?"

The ascent of sap in the xylem tissue of plants is the upward movement of water and minerals from the root to the aerial parts of the plant."

Mechanism: Several theories have been presented to explain the mechanism for the upward movement of water from root to the leaves."

107) Difference b/w cohesion, adhesion and Tension?"

Cohesions: In plants, water molecules are attracted to each other creating a hydrogen bond between them. This attraction is called cohesion and it allows water to form a continuous column inside the xylem."

Adhesion: Water molecules also stick to the wall of the xylem cells. This sticking is known as adhesion and the cellulose component of the xylem cell wall develops adhesive forces in the form. of hydrogen bonding with water molecules."

Tension: The process of transpiration, or water evaporating from leaves creates tension that pulls the column of water upwards from the roots through the xylem much like a straw This tension allows for the continuous flow of water from roots to leaves.

108) What is capillary action and casparian strip?

Capillary Actions: Capillary action is the ability of a liquid to flow in narrow arrow spaces or tubes, often against the force of gravity due to the combination of surface tension adhesive, and cohesive forces.

Casparion strips: The casparion strips is specialized structure composed of a water proof substance found in the roots of vascular plants. The casparion strips is located in the endodermis.

109) Define transpiration? Difference b/w stomatal, cuticular and lenticular transpiration?

Transpiration: The Loss of water in the the form of vapours from the aerial parts of the plant body is is called trans transpiration.

Stomatal Transpirations: It is the Lass of water through the stomata, are pores present on the leaf surface and surrounded by guard cell. About 80-90% of water Loss occurs through stomata.

Cuticular Transpiration: It is the loss of water through the cuticle (waxy layer around aerial parts of plant). It causes around 5-9% of transpiration in plants.

Lenticular Transpirations: It is the loss of water through Lenticels. lenticels are the tiny openings present on the woody bark. It accounts for about 1% of the total transpiration in plants."

110) Define transpirational pull? write the relation of the transpiration with the relation of opening and closing stomata?

Transpirational Pull: The force that pulls water upward in plants due to water vapour exiting through the stomata is known as transpirational pull."

Relation with Opening and Closing Stomata: Transpiration is also directly linked to the opening and closing of stomata. When stomata are open, water vapour escapes to the atmosphere increasing the rate of transpiration. This typically occurs during the day when the plants needs to take in carbon dioxide for photosynthesis. In contrast the stomata are closed, usually at night or in conditions of water stress, transpiration. decreases helping the plant conserve water."

111) Define Guard cell? Difference b/w source and sink?

Guard Cell:: Guard cells are specialized cells found in the epidermis of plant leaves, particularly in the lower epidermis. These cells have a unique shape resembling two kidney beans placed together.

Source: Translocation of organic solutes always takes place from the region of higher concentration of solute. ie the supply end (source).

Sink: To the region of lower concentration. Ie the consumption. or storage end (sink).

112) Define pressure flow theory?

It was hypothesized by Ernst Munch in 1930 and states that "The transport of organic solutes within the phloem is from the source (production area) to the sink (storage area) and is driven by an osmotically generated pressure gradient between these two regions. It is not widely accepted as an explanation of the mechanism of food transport and has been given the status of theory.

113) Define stomata? How xylem transport water?

Stomata: These gases diffuse into the intercellular spaces of the leaf through pores called stomata. The xylem transport water and dissolved minerals upward the roots to the rest of the direction from the top of plants. Unlike xylem the phloem can be either upwards in the phloem or downwards depending on where the nutrients need to be distributed.

114) Define aerenchyma? Difference b/w Homeostasis and osmoregulation?

- * **Aerenchyma:** Some aquatic plants have specialized tissues called aerenchyma.
- * **Homeostasis:** Homeostasis can be defined, as any self-regulatory process by which living organisms maintain stable internal body conditions.
- * **Osmoregulation:** It is the active regulation of osmotic pressure to maintain the balance of water and electrolytes in an organism. Osmoregulation depends upon the external conditions where plants grow.

115) Define the following in osmoregulation?

- * **Hydrophytes:** Hydrophytes are plants which live in conditions where the available water is more than the required water. These plants usually do not need to store water, and they have to lose water excessively.
- * **Mesophytes:** Mesophytes are plants that live in conditions where the available water is enough for their daily requirements, for example citrus, cabbage, peas and roses.
- * **Xerophytes:** These plants live in conditions where the available water is less than that required. For example: - Cactus, Opuntia, Aloe, Ruscus etc.
- * **Halophytes:** Halophytes are plants that are specially adapted to grow in saline environments such as coastal areas. For example - mangroves, saltbush, seagrasses.

116) Difference b/w Hypotonic, Hypertonic and isotonic?

- * **Hypotonic:** Hypotonic conditions are where the external solution has a lower solute concentration than the cell's cytoplasm.
- * **Hypertonic:** Hypertonic conditions are where the external solution has a higher concentration than the cell's cytoplasm.
- * **Isotonic:** Isotonic conditions are where the external solution's solute concentration matches the cell's cytoplasm.

Chapter no 9

Reproduction in plants

117) Define Reproduction? Difference b/w sexual and A-Sexual reproduction?

* **Reproduction:** Reproduction is a biological process through which new organisms are produced from their parents. It is the fundamental to the survival of species, allowing them to pass on their genetic information to succeeding generations.

* **Sexual reproductions:** involves two parents and produces offspring that are genetically different from their parents.

* **A-sexual reproduction:** On the other hand, involves only one parent and produces offspring that are identical to the parents.

118) Difference b/w binary fission and budding?

* **Binary Fission:** Binary fission is a method of asexual reproduction in prokaryotes. eg: bacteria. Binary fission occurs when a cell divides into two equal halves. Each half receives a copy of the DNA and grows to the size of original cell, becoming a new individual.

* **Budding:** Budding can be seen more prominently in certain types of algae and fungi. In this process an out growth or bud on the parent organism. New organisms develop from.

119) Define vegetative Propagation? Difference b/w natural and artificial vegetative propagation?

* **Vegetative Propagation:** Vegetative propagation is divided into natural methods which occur spontaneously in nature and artificial methods, which involve human assistance.

* **Natural vegetative propagation:** In natural vegetative propagation plants use structures such as stolon, (runners), rhizomes suckers and tubers to produce new plants for example:- strawberry plants send out runners, which are specialized stem that touch the ground develop roots and give rise to new independent plants.

* **Artificial vegetative propagation:** Artificial propagation is a method of plant reproduction that is facilitated by humans. Artificial vegetative propagation ensures that the offspring are genetically identical to the parent. This is particularly useful for propagation plants that do not produce viable seeds or to replicate desirable plant traits.

120) Define the following stolon, rhizomes, Tubers, suckers?

* **Stolon:** Some plants, like strawberries, produce horizontal stems called stolon, or runners that grow outwards from the base of the plants.

* **Rhizomes:** These are underground stems that grow horizontally in plants such as ginger and turmeric. They store starches and proteins and have nodes that can develop into upward growing shoots and roots, producing new plants.

* **Tubers:** Tubers are swollen underground structures, that store nutrients. The eye of a potato tuber are nodes with the potential to develop into new plant as it gives rise to new shoot, which extend upward while also forming roots.

* **Suckers:** These are new shoots that grow from the root system of the plant. Plants like roses and raspberry commonly produce suckers.

121) Different b/w leaf propagation and Nodes?

* **Leaf propagation:** Natural propagation through Leaves also known as leaf propagation.

* **Nodes:** Nodes are specific points on a plant stem where, leaves, root, and shoots, can develop and lead to the growth of new plants.

122) Difference b/w Layering, cutting and grafting?

* **Layering:** A method propagating a plant in which one shoot is fastened down to form roots while still attached to the parent plant.

* **Cutting:** A piece cut off from something, especially when something is being trimmed or prepared what remains when.

* **Grafting:** It involves joining the tissues of two plants so that they grow as a single plant. The upper part called scion is attached to the lower part called the root stock or stock. This method is used for propagate fruits plants.

123) Difference b/w scion and fruit salad trees?

* **Scion:** Scion is the upper part of a grafted plant often including stems or buds, while root stock is the base portion of the grafted plant providing anchorage and nutrients.

* **Fruit Salad Trees:** Through grafting, it is possible to create trees that produce different types of fruits on the same tree often called "Fruit salad trees."

124) Define Parthenogenesis and aphid?

* **Parthenogenesis:** Parthenogenesis is considered a type of a-sexual reproduction because it involves the development of an organism without fertilization of the female gamete by a male gamete.

* **Aphid:** Similarly, many aphid species can reproduce through parthenogenesis during favourable environmental conditions rapidly increasing their population without sexual reproduction.

125) Difference b/w cloning and tissue culture?

* **Cloning:** Cloning is the process of generating a generally identical copy of a cell or an organism.

* **Tissue Culture:** In tissue culturing techniques a small piece of plant tissue is taken from the parent plant and is placed in the culture medium containing all the necessary nutrients, hormones, and growth factors for the tissues to grow and develop into new plants.

126) Define the followings? Carpels, Corolla, Gynoecium, pedicel, receptacle, Whorls, androecium?

* **Carpel:** It can have one or more units called carpel.

* **Corolla:** Is made up of green sepals that protect the bud before it opens. The second whorl is called corolla.

* **Gynoecium:** The innermost whorl is the female reproductive part of a flower called gynoecium.

- * **Pedice**: The stalk that supports the flower is called pedice.
- * **Receptacle**: The swollen trip is called receptacle.
- * **Whorls**: Flower is made up of specialized Leaves and arranged in the form of four concentric whorls or rings.
- * **Androecium**: Stamens, collectively called androecium make the third whorl.

127) Difference b/w tepal and nectaries?

- * **Tepal**: In some flowers, petal and sepal are indistinguishable and are called tepal.
- * **Nectaries**: Are glands that secrete nectar, a fluid aid that attracts pollinators. Nectaries can be located on any part of the flowers.

128) Define pollination? Difference b/w fertilization and double pollination?

- * **Pollination**: This is the transfer of pollen from the male anther to the female stigma. Pollination occur with in the same flower, between flower on the same plant, or b/w flowers of different plants of the same species.
- * **Fertilization**: After pollination the pollen again germinates on the stigma and grow's a pollen tube down the style toward the ovary.
- * **Double Fertilizations**: The male gametes travel down the pollen tube into the ovary where double fertilization occurs.

129) Define germination? Difference b/w epigeal germination and hypogeal germination?

- * **Germination**: Germination is the process where a seed, spore or other reproductive body begins to sprout and grow into a new plant or organism, emerging from dormancy when condition like: water, oxygen and temperature are right.
- * **Epigeal Germination**: Inepigeal germination, hypocotyl elongates and it forces cotyledons to come above the ground. Seeds of melon, cucumber and beans show epigeal germination.
- * **Hypogeal Germination**: The epicotyl elongates and the cotyledons remains below the surface of the ground, egs maize, grain, and pea, etc.

130) Define the following? plumule, radicle, epicotyl, hypocotyl, hilum, micropyle?

- * **Plumule**: A minute bud at the upper end of the epicotyl is called plumule.
- * **Radicle**: The lower part of the hypocotyl is called the radicle.
- * **Epicotyl**: The portion between the plumule and the cotyledons is called epicotyl.
- * **Hypocotyls**: The portion between the cotyledon and the radical is called hypocotyl.
- * **Hilum**: On one end of the seed coat, is a small scar or hilum. It indicates the place of attachment of the seed in the fruit.
- * **Micropyles**: A tiny-pore near the hilum, allowing water absorption during germination.

Chapter no 10

Biodiversity and Classification

131) Define biodiversity? Difference b/w genetic, species, and ecosystem diversity?

* **Biodiversity:** Biodiversity refer to the variety of living Species on earth, including plant, animals, and microorganism. It encompasses the diversity within species and among different species with terrestrial, freshwater, and marine ecosystems.

* **Genetic diversity:** The variation with species. for example: different varieties of butterflies.

* **Species diversity:** The variety and abundance of different species present in an area •for example: pigeon, crow and sparrow.

* **Ecosystem diversity:** The variety of ecosystems including their unique communities of living organisms and environmental conditions. for example:- Desert and grassland, Forests, and wetland.

132) Define classification? How it help us to construct phylogenetic trees?

To study the vast diversity of living organisms scientists use a method called classification. Classification help us to construct the phylogenetic trees which depict the evolutionary history of species. These trees show how species are related through common ancestors.

133) Define taxonomy Difference b/w early and modern classification?

Taxonomy: Carlous Linnaeous is widely recognized as the "Father of modern taxonomy."

* **Early classification:** Systems grouped organism based on visible traits like size and shape leading to a simple morphology-based organization.

* **Modern classification:** Uses genetic information and evolutionary relationships, allowing for a more accurate and dynamics understanding of biodiversity. This shift from observable characteristics to molecular data has transformed our approach to classifying life, revealing deeper connections between of living organisms.

134) Define Binomial Nomenclature? Write its significant?

Binomial Nomenclature: This system allowed scientists to organize and compare species systematically. Linnaeus introduced a uniform system for naming using Binomial Nomenclature. Each species received a unique two part scientific name consisting of a genus name followed by a species name.

135) Write Rules of bionomial nomenclature?

* The name of a species has two parts: the first one is of the genus and the second is the species name. eg: in Ailurus fulgens, "Ailurus" represents the genus, and "fulgens" is the species name.

* The bionomial name is italicise in printed and typed formats, for example: Homo sapiens. However, the genus and species name must be underlined if written by hand.

* The first letter of the genus name is capitalized (uppercase) while the species name is written with a small letter. eg: Homo sapiens.

136) How does classification help scientists understand the evolutionary relationships between organisms? Compare the characteristics of fungi with animals and plants?

Classification help scientists understand the evolutionary by grouping organisms in a hierarchy based on shared characteristics revealing common ancestors, with closer groupings indicating closer environmental ties.

Fungi are distinct from plants and animals as heterotrophs with chitin cell walls using external digestion to absorb nutrients storing energy as glycogen and having cellular features more similar to animals but retaining plant-like traits.

137) Why was it challenging for biologists to classify organism like Euglena? what are Extremophiles and where can they survive?

They process a combination of both plant-like and animal like characteristics, making them difficult to fit into traditional taxonomic system.

Extremophiles: are organisms primarily microbes like archaeobacteria, that thrive in earth's most harsh, inhospitable environments—extreme heat, cold pressure, acidity, salinity or radiations where normal life can't survive found in places like deep-sea hydrothermal vents, acidic hot springs, salt lakes and even the deep crust.

138) How does the cell wall composition help differentiate Eubacteria from Archea? What are the three domains of life proposed by Carl Woese?

The key difference is that Eubacteria have cells walls made of peptidoglycan, a unique sugar-peptide polymer while Archaea lack peptidoglycan entirely instead possessing various structures like pseudopeptidoglycan, S-Layers, or other polysaccharides.

Carl Woese proposed the three domains of life: Bacteria, Archaea, Eukarya.

139) Outline the classification of oak? Which points must be ensured while writing the scientific name?

Oaks are the scientifically classified within the genus Quercus which belongs the beech family Fagaceae.

When writing a scientific name, always use two Latinized words italicize the whole name capitalise the Genus name, and use the species name in the lower case. The two words together from the unique species identifier like: Homo sapiens or Canis lupus (gray wolf).

Chapter no 11

Evolution

140) What is the effect of industrialization on the peppered moth in Britain? Define the theory of special creation?

Industrialization in 19th-century Britain caused a rapid evolutionary shift in the peppered moth (*Biston betularia*) population a phenomenon known as industrial melanism.

Theory of Special Creation is a religious belief that a supernatural being (God) created the universe and all life in a purposeful act often described in religious texts like Genesis with life appearing in its present, distinct form without evolution.

141) Define species, why is it difficult to define species? Differentiate b/w allopatric and sympatric speciation?

Species: A species is generally defined as a group of organism that can interbreed and produce fertile offspring. but it is hard to define because evolution means species blend, asexual organisms do not breed, fossils cannot interbreed and different concepts focus on different aspects leading to no single perfect definition of all life.

* **Allopatric speciation** involves geographic isolation, leading to divergence.

* **Sympatric speciation** occurs within the same habitat with reproductive isolation arising from factors like polyploidy or different ecological niches/mating behaviour (animals).

142) Briefly describes the environmental factor that induced variation? How can selective breeding be evidence of evolution?

Environmental Factors: Environmental factors induce variation by influencing how an organism's genes are expressed or by directly altering its physical and behavioral characteristics during its lifetime.

Selective breeding shows evolution is real by demonstrating how humans can drastically change species in short periods by choosing parents with desirable traits making those traits common.

143) What are vestigial organs? Name some vestigial organs present in the human body? Differentiate b/w homologous and analogous organ with example?

Vestigial Organs: are body parts that have lost their original function through evolution serving as evidence of common ancestry with human-example including the appendix, coccyx, wisdom teeth, and ear muscles.

* **Homologous organs:** Share a common ancestry and similar underlying structure but have different functions. eg: human arm, bat wings, whale flipper, showing divergent evolution.

* **Analogous organs:** Have similar functions but different structures and origin resulting from convergent evolution. eg: wings of birds, bats and insects etc.