

AL HUDA SCIENCE ACADEMY

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Most Important Short Questions with answers of Biology

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Short Questions No. 2

Q1: Define the branch of Biology "Genetics". Genetics is the branch of Biology that deals with the study of the transfer of characteristics from parents to offspring. In this field, scientists also study the causes of genetic diseases and develop better varieties of plants and animals.

Q2: Which branch of Biology involves the study of the development of organisms from fertilization to birth or hatching? The branch of Biology that involves the study of the process of development of an organism from a fertilized egg is Embryology. In this branch, scientists study tissue and organ formation, identify birth defects, and develop medical treatments.

Q3: Differentiate between morphology and physiology. Morphology is the study of the form and structure of organisms, examining both outward appearance (shape, colour, pattern) and internal structures like organs. Physiology, on the other hand, deals with the functioning of body parts, such as how the blood circulatory system transports vital substances.

Q4: Define the branch of Biology "Anatomy". Anatomy is the branch of Biology that explores the internal physical structure of organisms, particularly humans. It helps in disease diagnosis, medical device development, and improving the quality of life, for example, by studying digestive system organs.

Q5: Define the branch of Biology "Palaeontology". Palaeontology is the branch of Biology that deals with the study of fossils. Fossils are the remains of plants and animals preserved in rocks, and their examination helps scientists know the evolutionary history of organisms.

Q6: Define the branch of Biology "Marine Biology". Marine Biology is the branch of Biology that deals with the study of life in oceans. It helps to understand ocean biodiversity, discover new species, and address marine conservation issues.

Q7: Define the branch of Biology "Pathology". Pathology is the study of diseases, their causes, and effects. This branch helps in disease diagnosis, prevention, and treatment, such as studying how uncontrolled cell division causes cancer.

Q8: What do you know about genetics? Genetics is the branch of Biology that deals with the study of the transfer of characteristics from parents to offspring. It also involves studying the causes of genetic diseases and developing better varieties of plants and animals.

Q9: Differentiate between pathology and pharmacology. Pathology is the study of diseases, their causes, and effects, which aids in diagnosis and treatment. Pharmacology is the branch that studies drugs and their effects on the body, helping in the development of new medications like antibiotics.

Q10: What is marine biology? Marine Biology is the branch of Biology that deals with the study of life in oceans. It is used to understand ocean biodiversity, discover new species, and address marine conservation issues.

Q11: Difference between zoology and botany. Zoology is the study of animals, including their behaviour and diversity. Botany is the study of plants, including their structure, function, growth, reproduction, and interactions with their environment.

Q12: What are Fossils? Also write the age of the oldest Fossil. Fossils are the remains of plants and animals that were preserved in rocks and other geological formations. The oldest known fossil is a Cyanobacterium, estimated to be 3.5 billion years old.

Q13: How does Allah say in the Quran about the development of animals including human beings?

The Quran states that Allah created every living thing from water. Regarding humans, it mentions creation from clay and development through stages: a drop, a clot, a little lump, bones, and then flesh. For animals, it says they were created from water; some creep on bellies, others walk on two legs, and others on four.

Q14: Define scientific method. Write down the steps involved in the scientific method. The scientific method consists of specific steps scientists take for conducting research. The steps involved are: 1. Recognition of a scientific problem, 2. Observation, 3. Hypothesis, 4. Deduction, 5. Experiments, and 6. Results.

Q15: Differentiate between qualitative and quantitative observations. Qualitative observations cannot be measured with numbers (e.g., the colour of a flower). Quantitative observations involve measurements or numerical data (e.g., the number of birds) and are considered more accurate because they are invariable and measurable.

Q16: Write down the characteristics of a hypothesis. A hypothesis is a proposed statement to answer a scientific problem. Its characteristics include: it matches available observations, it is testable through experiments, and there is always a way to disprove it.

Q17: Define deduction. Deductions are logical results developed from hypotheses. They usually follow the pattern of "if-then" statements, where scientists assume that if a hypothesis is true, then certain results should follow.

Q18: Differentiate between experimental group and control group. In an experiment, the experimental group is the one where the variable being tested is applied (e.g., a plant not provided with CO₂). The control group is treated normally (e.g., a plant provided with CO₂) to serve as a comparison.

Q19: Difference between theory and principle. A theory is an explanation supported by extensive evidence and repeatedly validated by researchers. If a theory is proved again and again by experiments and withstands all tests, it becomes a law or principle, which is a uniform fact of nature.

Q20: Write down two key benefits of biodiversity. Biodiversity helps maintain ecosystem stability by playing a role in biogeochemical cycles like the carbon and nitrogen cycles. It also provides natural resources such as food, medicine, building materials, and fuel.

Q21: Define biodiversity. Also write the bases of measuring diversity. Biodiversity refers to the variety of organisms in a particular area. It is measured by considering the number of different kinds of organisms and the variation within each kind in that area.

Q22: What is the importance of Biodiversity? Biodiversity is important for ecosystem stability, climate regulation (via CO₂ absorption), and providing natural resources like food and medicine. It also supports economies through agriculture, tourism, and pharmaceuticals.

Q23: How does Biodiversity maintain the ecosystem? Biodiversity maintains ecosystem balance by participating in biogeochemical cycles, such as the carbon and nitrogen cycles. It ensures the stability of ecosystems through the roles played by various organisms.

Q24: When and why is International Biodiversity Day celebrated? International Biodiversity Day is celebrated on May 22nd. The United Nations designated this day to promote the protection of biodiversity.

Q25: What are the aims of classification? The main aims of classification are to determine similarities and differences among organisms so they can be studied easily, and to find the evolutionary relationships among them.

Q26: Write down two advantages of classification. Classification groups similar organisms together, making it easier to identify and understand their characteristics and relationships. It also provides a common language for biologists globally, enabling effective communication.

Q27: Define classification and biodiversity. Classification is the process in which organisms are divided into groups and subgroups based on their similarities and differences. Biodiversity means the variety of organisms in a particular area, measured by kinds of organisms and their variations.

Q28: Define taxonomy and systematics. Taxonomy is the branch of Biology that deals with the classification of organisms into groups based on similarities and differences.

Q29: What are the bases of classification of biodiversity? Biologists classify organisms based on similar physical characteristics. In recent times, classification also relies on genetics to find genetic similarities and differences, which helps in understanding structures and functions.

Q30: What are the seven taxonomic ranks used in the Linnaean system? The seven taxonomic ranks in the Linnaean system are kingdom, phylum (or division), class, order, family, genus, and species.

Q31: What are taxonomic ranks? Who devised them? Taxonomic ranks (or taxa) are the groups into which organisms are classified. The Swedish botanist Carl Linnaeus devised the system of taxonomic ranks in 1735.

Q32: Write down the taxonomic rank of Human. The taxonomic classification for Humans is — Domain: Eukarya, Kingdom: Animalia, Phylum: Chordata, Class: Mammalia, Order: Primates, Family: Hominidae, Genus: Homo, Species: Homo sapiens.

Q33: Define species. A species is the lowest level of classification. It is defined as a group of similar organisms that can interbreed and produce fertile offspring (capable of reproduction).

Q34: Define Taxa or Taxonomic rank. Who introduced it? Taxa (singular: taxon) or taxonomic ranks are the groups into which organisms are classified. This system was devised by Carl Linnaeus in 1735.

Q35: Define the following: i) Phylum ii) Class i) Phylum (or Division for plants/fungi) is a taxonomic rank where a kingdom is subdivided into related phyla. ii) Class is a rank where each phylum/division is divided into related classes.

Q36: Define the following: i) Genus ii) Species i) Genus is a taxonomic rank where a family is divided into related genera. ii) Species is the lowest rank, consisting of similar organisms that can interbreed and produce fertile offspring.

Q37: What are the basic differences between archaea and bacteria? Archaea and Bacteria are both prokaryotes, but bacterial cell walls contain peptidoglycan, while archaeal cell walls lack it and are made of proteins. Archaeal rRNA resembles eukaryotes more than bacteria, and their membrane lipids allow them to survive in extreme environments.

Q38: Write some features of organisms of domain Archaea. Organisms in domain Archaea are prokaryotes with cell walls lacking peptidoglycan. They have unique membrane lipids enabling them to live in extreme environments like hot springs and salt lakes. Some obtain energy from inorganic compounds like sulphur.

Q39: Write some characteristics of organisms of domain Bacteria. Bacteria are prokaryotes with cell walls made of peptidoglycan. They are unicellular, sometimes forming colonies, and can be heterotrophic or autotrophic. They are found in diverse environments including soil, water, and air.

Q40: Differentiate between domain Bacteria and domain Eukarya. Domain Bacteria consists of prokaryotic cells which lack a nucleus and nuclear envelope, and have cell walls made of peptidoglycan. Domain Eukarya consists of eukaryotic cells which have a prominent nucleus, membrane-bound organelles, and are larger and more complex.

Q41: Differentiate between kingdom Animalia and kingdom Plantae. Kingdom Plantae includes multicellular, eukaryotic autotrophs that have cell walls made of cellulose and prepare food via photosynthesis. Kingdom Animalia includes multicellular, eukaryotic heterotrophs that lack cell walls, ingest food, and digest it internally.

Q42: What are the bases of classification of life into domains? The classification of life into three domains is based on the differences between prokaryotes (divided into Archaea and Bacteria) and eukaryotes. It considers differences such as cell wall composition and rRNA sequences.

Q43: Describe the three-domain system of classification. Proposed by Carl Woese in 1977, this system classifies all organisms into three domains: Archaea, Bacteria, and Eukarya. It divides prokaryotes into two domains (Archaea and Bacteria) based on their differences, while all eukaryotes are placed in the domain Eukarya.

Q44: Which kingdom includes organisms that are multicellular and heterotrophic, and lack cell walls? Kingdom Animalia includes organisms that are multicellular, heterotrophic, and lack cell walls. They ingest food and digest it within their bodies.

Q45: Enlist the distinguishing characteristics of fungi. Fungi are eukaryotic heterotrophs that have cell walls made of chitin. They obtain nutrients by absorbing food from decaying matter rather than ingesting it. They can be multicellular (e.g., mushrooms) or unicellular (e.g., yeast).

Q46: List the three domains that encompass all living organisms. The three domains that encompass all living organisms are Archaea, Bacteria, and Eukarya.

Q47: Write a note on kingdom Fungi. Kingdom Fungi consists of eukaryotic heterotrophs with cell walls made of chitin. They absorb nutrients from decaying organic matter. Examples include multicellular fungi like mushrooms and molds, and unicellular fungi like yeast.

Q48: Write a note on kingdom Protista. Kingdom Protista includes eukaryotic organisms that are unicellular, colonial, or simple multicellular. It contains plant-like protists (algae), animal-like protists (protozoans), and fungus-like protists.

Q49: Write features of Kingdom Protista. Protists are eukaryotes that do not fit into other kingdoms and can be unicellular or simple multicellular. Some are autotrophs (algae) with cellulose walls, some are heterotrophs (protozoans) with no cell wall, and some are fungus-like absorbers.

Q50: Write characteristics of Kingdom Fungi. Fungi are heterotrophic eukaryotes with chitin in their cell walls. They are absorptive heterotrophs, meaning they absorb nutrients from their surroundings. They include both multicellular forms like mushrooms and unicellular forms like yeast.

Q51: What type of organism is kingdom Plantae? Kingdom Plantae consists of eukaryotic, multicellular organisms that are autotrophic. They have cell walls made of cellulose and produce food through photosynthesis.

Q52: Why can't we classify viruses in any kingdom? Viruses are not included in any kingdom because they are acellular and lack the characteristics of living organisms found in the three domains. They do not have cells or organelles and cannot run metabolism independently.

Q53: Write a short note on prions and viroids. Prions and viroids are acellular particles not included in the classification system. Prions are composed only of protein, while viroids are composed only of circular RNA; both cause infectious diseases in plants and can be a cause of cancer.

Q54: What are the symptoms of COVID-19? Common symptoms of COVID-19 include fever, cough, shortness of breath, fatigue, body aches, loss of taste or smell, sore throat, and headache. In severe cases, it leads to respiratory problems.

Q55: What preventive measures can be taken for COVID-19? Preventive measures include wearing a mask over the nose and mouth, frequently washing hands with soap for at least 20 seconds, using hand sanitizer with 60% alcohol, and vaccination to help the immune system fight the virus.

Q56: How does binomial nomenclature facilitate clear communication about organisms across different languages? Binomial nomenclature provides a unique, standard scientific name for every organism (in Latin) that is the same worldwide. This avoids confusion caused by different common names in different languages and regions.

Q57: Define binomial nomenclature. Also write an example. Binomial nomenclature is the system of giving scientific names to organisms, consisting of two parts: the genus name and the species name. An example is the scientific name for humans, *Homo sapiens*.

Q58: What is the scientific name for potato and honey bee? The scientific name for potato is *Solanum tuberosum*. The scientific name for the honey bee is *Apis cerana*.

Q59: What is the significance of binomial nomenclature? It ensures that every organism has a unique name, avoiding duplication. Since the names are in Latin, they are universal and standard across all countries and languages, facilitating effective scientific communication.

Q60: Write some rules of binomial nomenclature.

1. Names are taken from Latin.
- 2) The genus name comes first (capitalized) followed by the species name (small letter).
- 3) Names should be italicized when printed or underlined separately when handwritten.

Q61: Common names have no scientific basis. Explain. Common names often do not reflect scientific accuracy; for example, "fish" is used for "star fish" or "jellyfish," which are not true vertebrates. Also, one organism can have many common names, causing confusion.

Q62: Write the scientific name of Onion, Potato and Tomato. Onion is *Allium cepa*, Potato is *Solanum tuberosum*, and Tomato is *Solanum esculentum*.

Q63: What is the scientific name of Honey Bee, Tiger and Human beings? Honey Bee is *Apis cerana*, Tiger is *Panthera tigris*, and Human being is *Homo sapiens*.

Q64: What are the main functions of the cell membrane? The cell membrane acts as a selectively permeable barrier, allowing only certain molecules to pass while blocking others. It encloses the cytoplasm and maintains the cell's internal environment.

Q65: What key role does the Golgi apparatus play in eukaryotic cells? The Golgi apparatus modifies proteins received from the rough endoplasmic reticulum and packs them into small sacs called Golgi vesicles. These vesicles can be transported out of the cell as secretions or used internally.

Q66: How do lysosomes contribute to the cell's functioning? Lysosomes contain digestive enzymes that break down food particles within food vacuoles. They also digest and recycle cellular waste and damaged organelles, and can store certain molecules for later use.

Q67: What is the smooth endoplasmic reticulum responsible for? The smooth endoplasmic reticulum (SER) is responsible for lipid metabolism and transporting materials within the cell. It also detoxifies harmful chemicals and, in muscle cells, aids in contraction.

Q68: How do the vacuoles in plant cells differ from vacuoles in animal cells? Plant cells typically have a single, large central vacuole formed by the fusion of smaller ones, which maintains turgor pressure. Animal cells usually have many small, temporary vacuoles used for storage or digestion.

Q69: What could happen if lysosomal enzymes stop working properly? If lysosomal enzymes fail, the cell would be unable to digest food or break down waste and damaged organelles. This would lead to an accumulation of waste materials, potentially disrupting cell function.

Q70: Why are the cristae important for cellular respiration? Cristae are the folds of the inner membrane of mitochondria. They increase the surface area available for the chemical reactions of aerobic respiration, allowing for more efficient energy production.

Q71: How are chromatin and chromosomes related? Chromatin is the fine, thread-like material made of DNA and proteins found in the nucleus during interphase. When the cell divides, chromatin condenses and thickens to form distinct structures called chromosomes.

Q72: Name the chemical compounds that make up: (a) Cell membrane (b) Fungal cell wall (c) Plant cell wall (d) Bacterial cell wall (e) Ribosomes (f) Chromosomes. (a) Cell membrane: Proteins, lipids, and carbohydrates. (b) Fungal cell wall: Chitin. (c) Plant cell wall: Cellulose, hemicellulose, pectin (primary wall). (d) Bacterial cell wall: Peptidoglycan. (e) Ribosomes: Proteins and ribosomal RNA (rRNA). (f) Chromosomes: DNA and proteins.

Q73: Differentiate between primary and secondary wall. The primary wall is the outer layer of the plant cell wall, composed mainly of cellulose, hemicellulose, and pectin. The secondary wall forms inside the primary wall in some cells (like xylem) and is mainly composed of cellulose and lignin.

Q74: What are plasmodesmata? Plasmodesmata are channels present in plant cell walls that allow for the exchange of molecules and communication between adjacent plant cells.

Q75: Explain the fluid mosaic model. The fluid mosaic model describes the cell membrane structure as a fluid-like lipid bilayer in which protein molecules are submerged. The lipids and proteins can move laterally, creating a constantly changing "mosaic" pattern.

Q76: Write down two functions of cytoplasm. The cytoplasm provides a medium for organelles to move and function. It also serves as the site for various metabolic reactions, such as glycolysis (breakdown of glucose).

Q77: Why is DNA called hereditary material? DNA contains genes that control all cell activities and is responsible for transmitting characteristics from parents to the next generation. This role in inheritance makes it the hereditary material.

Q78: What is chromatin? Chromatin is the fine, thread-like material found in the nucleoplasm of the nucleus. It is composed of DNA and proteins and condenses into chromosomes during cell division.

Q79: Differentiate between microtubules and microfilaments. Microtubules are thick, hollow tubes made of tubulin that maintain cell shape and form spindle fibres. Microfilaments are finer threads made of actin that help in cell movement and muscle contraction.

Q80: Describe the location of ribosomes and their composition. Ribosomes are found floating freely in the cytoplasm or attached to the rough endoplasmic reticulum. They are composed of almost equal amounts of proteins and ribosomal RNA (rRNA).

Q81: Differentiate between rough endoplasmic reticulum and smooth endoplasmic reticulum. Rough Endoplasmic Reticulum (RER) has ribosomes attached to its surface and is involved in protein synthesis. Smooth Endoplasmic Reticulum (SER) lacks ribosomes and is involved in lipid metabolism and detoxification.

Q82: Define cisternae. Cisternae are the flattened, fluid-filled sacs that are stacked over each other to form the Golgi apparatus.

Q83: What are lysosomes? Write its two functions. Lysosomes are membrane-bound vesicles containing digestive enzymes. Their functions include breaking down food in food vacuoles and digesting cellular waste or damaged organelles.

Q84: Describe the structure of the inner membrane of chloroplasts. The inner membrane of a chloroplast encloses the stroma and thylakoids. Inside, it forms stacks of membrane-bound sacs called grana (singular: granum), where photosynthetic pigments are located.

Q85: Differentiate between chromoplast and leucoplast. Chromoplasts contain bright pigments (like carotenoids) and are found in flowers and fruits, helping in pollination. Leucoplasts are colourless and are used for storing starches, lipids, and proteins in roots and seeds.

Q86: Write down the location and structure of centrioles. Centrioles are located near the nuclear envelope in animal cells (forming a centrosome). Structurally, each centriole is barrel-shaped and formed of 9 triplets of microtubules.

Q87: Differentiate between cilia and flagella. Cilia are short and numerous, used for movement. Flagella are longer and fewer in number (usually one or two). Both are made of microtubules in eukaryotes.

Q88: What is a chloroplast? A chloroplast is a green plastid found in plants and algae. It contains chlorophyll and is the site of photosynthesis, converting light energy into chemical energy (food).

Q89: What do you know about the nucleus? The nucleus is the control center of eukaryotic cells, bounded by a double nuclear envelope containing pores. It contains the nucleolus and chromatin (DNA), controlling cell activities and inheritance.

Q90: When and how was the first cell discovered? The cell was first discovered in 1665 by Robert Hooke. He examined a thin slice of cork under a simple microscope and observed tiny box-like structures he called "cells".

Q91: What is the middle lamella? Write its structure. The middle lamella is a layer between the primary walls of adjacent plant cells. It holds the cells together and contains magnesium, calcium, and pectin.

Q92: Define Cristae and Matrix. Cristae are the folds of the inner membrane of mitochondria that increase surface area for respiration. The matrix is the fluid-like material inside the inner membrane of the mitochondrion.

Q93: What are plastids? Name their types. Plastids are membrane-bound organelles found in plants and algae. The three main types are chloroplasts (photosynthesis), chromoplasts (pigmentation), and leucoplasts (storage).

Q94: What are chromoplasts? Write their function. Chromoplasts are plastids containing bright pigments like carotenoids. Their function is to give colour to flowers and fruits, aiding in pollination and seed dispersal.

Q95: What are Leucoplasts? Where are they located? Leucoplasts are colourless plastids involved in storage. They are located in plant parts where food is stored, such as underground stems, roots, and seeds.

Q96: Define Turgor pressure and Turgor. Turgor pressure is the outward pressure exerted by the fluid in the central vacuole against the cell wall. This state of being rigid and swollen due to pressure is called turgor, which maintains cell shape.

Q97: What are centrioles? Centrioles are barrel-shaped organelles made of microtubules, found in animal cells and most protists. They are usually present in a pair (centrosome).

Q98: Write the functions of centrioles. Centrioles help in the formation of spindle fibres during cell division, which separate chromosomes. They also form basal bodies, which give rise to cilia and flagella.

Q99: Write down the role of mesophyll cells. Mesophyll cells are specialized cells in plant leaves rich in chloroplasts. Their primary role is to perform photosynthesis by capturing light energy with chlorophyll.

Q100: What are muscle cells and write their function. Muscle cells are specialized animal cells elongated and filled with contractile proteins. Their function is to contract and relax, enabling movement of the body and internal organs.

Q101: Write the role of skeletal muscles. Skeletal muscle cells are attached to bones and are voluntary in action. Their role is to move the skeleton, facilitating body movements and locomotion.

Q102: Differentiate between axons and dendrites. Dendrites are short extensions of a neuron that receive nerve impulses and transmit them to the cell body. Axons are longer extensions that carry nerve impulses away from the cell body.

Q103: Describe the role of neurons. Neurons are specialized cells of the nervous system. They are responsible for transmitting messages (nerve impulses) throughout the body to coordinate functions.

Q104: Write down the significance of liver cells. Liver cells (hepatocytes) are significant for storing glycogen, iron, and vitamins, detoxifying toxic substances, producing blood-clotting proteins, and secreting bile for digestion.

Q105: Write the importance of Epidermis. Epidermal cells form the outer protective layer of plant organs. They protect internal tissues, reduce water loss (via cuticle), and in roots, help absorb water through root hairs.

Q106: Differentiate between Dendrites and Axon. Dendrites are the parts of a neuron that carry impulses towards the cell body, whereas axons are the parts that carry impulses away from the cell body.

Q107: What are hepatocytes? Write their importance. Hepatocytes are liver cells. They are important for metabolic functions such as detoxification, protein synthesis, and the storage of nutrients like glycogen and iron.

Q108: What is meant by division of labour within cells? Division of labour within a cell means that different organelles perform specific, distinct functions (e.g., mitochondria for energy, ribosomes for protein) to ensure the cell's survival and efficiency.

Q109: How would you define a stem cell? A stem cell is an unspecialized cell that has the ability to divide and differentiate into a variety of specialized cell types.

Q110: Define stem cells. Write their importance. Stem cells are unspecialized cells capable of dividing and differentiating into specific cell types. They are important for growth, development, and repairing damaged tissues in the body (like wound healing or blood cell production).

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Short Questions No. 3

Q1: Enlist the events that occur during the G1 phase of interphase. The G1 phase (First Gap) is the first stage of interphase. During this phase, the cell grows in size and increases its supply of proteins and organelles (such as mitochondria and ribosomes). The cell also synthesizes various enzymes that are required for the replication of DNA in the next phase (S phase).

Q2: What is the main purpose of the S phase in the cell cycle? The main purpose of the S phase (Synthesis phase) is the replication of DNA. During this phase, the cell makes a copy of its entire genetic material so that each chromosome consists of two sister chromatids. This ensures that both daughter cells will receive a complete set of chromosomes after division.

Q3: Define cell cycle. Write its phases. The cell cycle is the series of events that take place in a eukaryotic cell from its formation to its division into two daughter cells. It consists of two main phases: Interphase (which includes G1, S, and G2 phases) and the M Phase (Mitotic phase), where cell division occurs.

Q4: What do you know about the S phase? The S phase, or Synthesis phase, occurs during interphase. In this phase, the cell replicates its DNA. As a result, each chromosome, which previously consisted of a single chromatid, is duplicated to have two sister chromatids joined at the centromere.

Q5: Define G2 phase. The G2 phase (Second Gap) follows the S phase. In this phase, the cell continues to grow and synthesizes proteins essential for cell division, such as those needed for the production of spindle fibers. The cell also checks for and repairs any DNA errors before entering mitosis.

Q6: Differentiate between Interphase and Division phase. Interphase is the preparatory phase lasting about 90% of the cell cycle, during which the cell grows, replicates DNA, and prepares for division. The Division phase (M Phase) is the shorter period where the cell physically divides its nucleus (mitosis/meiosis) and cytoplasm (cytokinesis) to form daughter cells.

Q7: During which phase of mitosis do sister chromatids separate? Sister chromatids separate during the Anaphase of mitosis. In this stage, the spindle fibers attached to the kinetochores pull the sister chromatids apart towards opposite poles of the cell.

Q8: What is the role of spindle fibers in mitosis? Spindle fibers are microtubule structures that form the mitotic spindle. Their main role is to attach to the chromosomes at the kinetochore and align them at the cell's equator. Later, they contract to pull the sister chromatids apart to opposite poles, ensuring equal distribution of genetic material.

Q9: How is cytokinesis in an animal cell different from a plant cell? In animal cells, cytokinesis occurs via a cleavage furrow where a ring of microfilaments contracts to pinch the cell in two. In plant cells, vesicles from the Golgi apparatus fuse in the center to form a cell plate (phragmoplast), which grows outward to divide the cell.

Q10: What are the key events of anaphase in mitosis? The key events of anaphase include the splitting of the centromere and the separation of sister chromatids. The spindle fibers shorten and pull the separated chromatids (now individual chromosomes) toward opposite poles of the cell.

Q11: How is mitosis related to the process of regeneration? Regeneration is the ability of organisms to replace lost or damaged body parts (e.g., a sea star regenerating an arm). This process relies on mitosis to produce the new cells needed to regrow the tissue and restore the lost part.

Q12: Define mitosis. Mitosis is a type of cell division in which a parent cell divides into two daughter cells, each having the same number of chromosomes as the parent cell. It occurs in somatic (body) cells and is essential for growth and repair.

Q13: Differentiate between karyokinesis and cytokinesis. Karyokinesis is the division of the nucleus, involving the separation of chromosomes. Cytokinesis is the division of the cytoplasm, which physically splits the cell into two distinct daughter cells after nuclear division is complete.

Q14: How is the mitotic spindle formed? In animal cells, the centrosome replicates and moves to opposite poles, organizing microtubules to form spindle fibers. In plant cells, which lack centrioles, the spindle fibers are formed by the aggregation of tubulin proteins present in the cytoplasm.

Q15: Write a note on cytokinesis in an animal cell. Cytokinesis in animal cells begins with the formation of a cleavage furrow in the cell membrane. A contractile ring of microfilaments beneath the membrane constricts, deepening the furrow until the parent cell is pinched into two separate daughter cells.

Q16: Write down the significance of mitosis. Mitosis is significant for growth, allowing organisms to increase in size. It enables cell replacement for healing wounds and replacing worn-out cells (like red blood cells). It is also the mechanism for asexual reproduction and regeneration in some organisms.

Q17: Describe the errors of mitosis. Errors in mitosis can lead to uncontrolled cell division. If the genes controlling the cell cycle are mutated, cells may divide continuously, forming masses called tumors. Such errors can result in benign or malignant (cancerous) growth.

Q18: What do you know about tumors? Tumors are masses of cells formed due to uncontrolled cell division (mitosis). They occur when the regulation of the cell cycle fails. Tumors can be benign (localized) or malignant (spreading to other tissues, known as cancer).

Q19: Can you distinguish between chromatin and chromosome? Chromatin is the loose, thread-like form of DNA and proteins present during interphase. Chromosomes are the condensed, thick, and visible structures formed from chromatin during cell division (prophase) to facilitate segregation.

Q20: Differentiate between benign and malignant tumors. Why does it occur? Benign tumors remain at their original site and do not invade other tissues. Malignant tumors invade surrounding tissues and spread to other body parts (metastasis). They occur due to mutations in genes that regulate the cell cycle, leading to uncontrolled division.

Q21: Define phragmoplast. Phragmoplast is a structure formed during cytokinesis in plant cells. It is created by the fusion of vesicles derived from the Golgi apparatus at the center of the dividing cell, eventually forming the cell plate and new cell walls.

Q22: How does crossing over contribute to genetic variation in meiosis? Crossing over occurs during Prophase I of meiosis. It involves the exchange of DNA segments between non-sister chromatids of homologous chromosomes. This creates new combinations of genes (recombination), leading to genetic variation in the offspring.

Q23: What are sister chromatids, and when do they separate in meiosis? Sister chromatids are the identical copies of a single chromosome connected at the centromere. In meiosis, they separate during Anaphase II, moving to opposite poles to ensure each gamete gets a haploid set.

Q24: What is meant by diploid and haploid cells? Diploid ($2n$) cells contain chromosomes in homologous pairs (full set). Somatic cells are diploid. Haploid (n) cells contain only one chromosome from each pair (half set). Gametes (sperm and egg) are haploid.

Q25: Define Crossing over. Crossing over is the process in Meiosis I where non-sister chromatids of homologous chromosomes exchange segments of genetic material. This results in new genetic combinations and diversity.

Q26: What is chiasmata? Chiasmata (singular: chiasma) are the X-shaped points of attachment between non-sister chromatids of homologous chromosomes. They are the sites where crossing over occurs during Prophase I of meiosis.

Q27: Write down the significance of meiosis. Meiosis is essential for sexual reproduction as it produces haploid gametes, ensuring the chromosome number remains constant across generations. It also introduces genetic diversity through crossing over and independent assortment.

Q28: How does meiosis bring genetic diversity? Meiosis brings genetic diversity primarily through crossing over, which shuffles genes between homologous chromosomes. Additionally, the random separation of homologous pairs creates unique combinations of chromosomes in the gametes.

Q29: What do you know about disjunction and non-disjunction? Disjunction is the normal separation of chromosomes during anaphase. Non-disjunction is the failure of chromosomes or chromatids to separate properly. This leads to gametes with abnormal chromosome numbers, causing genetic disorders.

Q30: Can you distinguish between Mitosis and Meiosis? Mitosis involves one division producing two identical diploid daughter cells and occurs in somatic cells. Meiosis involves two divisions producing four genetically different haploid daughter cells and occurs in germ cells for reproduction.

Q31: Enlist the levels of organization from cells to organ systems. The levels of organization from simplest to complex are: Atom → Molecule → Organelle → Cell → Tissue → Organ → Organ System → Organism.

Q32: What do you know about the atom and molecule level of organization? Atoms (e.g., C, H, O) are the smallest units of matter. They combine to form molecules (e.g., water, proteins, DNA). These biomolecules are the building blocks of organelles and cells.

Q33: Differentiate between cell and organelle. An organelle is a subcellular structure (like mitochondria) that performs a specific task within a cell. A cell is the basic unit of life, formed by the assembly of organelles, capable of independent life functions and reproduction.

Q34: Define organ. Give examples. An organ is a structure composed of related tissues working together to perform specific functions. Examples include the heart and lungs in animals, and leaves and roots in plants.

Q35: Explain "The interaction of various organ systems brings emergent properties." Emergent properties are new functions that arise from the interaction of simpler parts. For example, consciousness or behavior in an organism is an emergent property resulting from the coordinated interaction of the nervous system and other organ systems.

Q36: What is an organ system? Give examples. An organ system consists of multiple organs working together to perform major body functions. Examples include the digestive system (stomach, intestines) in animals and the root system in plants.

Q37: What is the tissue level? Give one example. The tissue level consists of groups of similar cells that work together to perform a specific function. An example is epithelial tissue in animals, which covers body surfaces, or xylem tissue in plants.

Q38: Differentiate between unicellular organisms and multicellular organisms. Unicellular organisms consist of a single cell that performs all life functions (e.g., bacteria). Multicellular organisms are made of many cells organized into tissues, organs, and systems (e.g., humans, plants).

Q39: What is the function of the palisade mesophyll in the leaf? Palisade mesophyll cells are located beneath the upper epidermis of the leaf. They are packed with chloroplasts and are the primary site for photosynthesis, capturing light energy to make food.

Q40: Differentiate between the following: (i) **Tissue and Organ:** A tissue is a group of similar cells (e.g., muscle tissue), while an organ is a group of different tissues working together (e.g., heart). (ii) **Root system and Shoot system:** Root system is underground and absorbs water (roots). Shoot system is above ground and performs photosynthesis/reproduction (stems, leaves). (iii) **Epidermal and Mesophyll tissue:** Epidermal is the protective outer layer. Mesophyll is the internal tissue for photosynthesis. (iv) **Palisade and Spongy mesophyll:** Palisade has tight, chloroplast-rich cells for photosynthesis. Spongy has loose cells with air spaces for gas exchange.

Q41: Write any two functions of roots.

1. Roots anchor the plant firmly in the soil.
2. They absorb water and essential minerals from the soil for the plant.

Q42: What are the functions of the root system? The root system anchors the plant, absorbs water and minerals from the soil, and transports them to the shoot system. It can also store reserve food.

Q43: What are the functions of the shoot system? The shoot system (stems, leaves, flowers) supports the plant, conducts photosynthesis (making food), and facilitates reproduction (flowers and fruits).

Q44: What is the function of the lungs in humans? The lungs are the organs of respiration. They facilitate the exchange of gases, taking in oxygen from the air into the blood and removing carbon dioxide from the blood to the air.

Q45: What is the function of xylem in plants? Xylem is a vascular tissue responsible for the transport of water and dissolved minerals from the roots to the stems and leaves.

Q46: What does the vascular tissue in a plant do? Vascular tissue is responsible for transport. Xylem transports water and minerals from roots to leaves, while phloem transports food (sugars) from leaves to other parts of the plant.

Q47: Define transpiration. Transpiration is the process of loss of water vapor from the aerial parts of the plant, mainly through small pores in the leaves called stomata.

Q48: Differentiate between Xylem and Phloem. Xylem transports water and minerals from roots upwards. Phloem transports organic food (sugars/sucrose) from leaves to other plant parts. Xylem cells are often dead/hollow, while phloem contains living cells.

Q49: What are the major roles of the epithelial tissue present in the stomach? The epithelial tissue in the stomach secretes mucus to protect the stomach lining from acid. It also secretes gastric juice containing enzymes (like pepsinogen) and hydrochloric acid for digestion.

Q50: How do smooth muscles contribute to the stomach's function? Smooth muscles in the stomach wall contract and relax to mix the food with gastric juice and move it forward. This churning action aids in mechanical digestion.

Q51: What are the functions of the liver and kidneys in humans? The liver filters blood, produces bile for digestion, and detoxifies substances. The kidneys filter waste products from the blood to produce urine and regulate water balance.

Q52: What is the function of the pancreas? The pancreas produces digestive enzymes for breaking down food in the intestines. It also acts as an endocrine gland, producing hormones like insulin to regulate blood sugar levels.

Q53: Write down the location and function of connective tissue in the stomach. Connective tissue in the stomach lies beneath the epithelial layer (submucosa) and also forms the outermost covering (serosa). It provides structural support and houses blood vessels and nerves.

Q54: Write a note on the skeletal system of humans. The skeletal system consists of bones, cartilage, and tendons. It provides structural support, protects internal organs, allows movement by serving as muscle attachment points, stores minerals, and produces blood cells.

Q55: What is the function of the respiratory system? The respiratory system (lungs, trachea) is responsible for gas exchange. It brings oxygen into the body for cellular respiration and expels carbon dioxide, a waste product.

Q56: Differentiate between the nervous system and blood circulatory system. The nervous system (brain, nerves) coordinates body functions via electrical impulses. The circulatory system (heart, blood vessels) transports substances like oxygen, nutrients, and hormones via blood.

Q57: What does epithelial tissue do in animals? Epithelial tissue covers body surfaces and lines internal cavities. Its functions include protection (skin), absorption (intestine), and secretion (glands).

Q58: Which organ system provides structural support for the body? The Skeletal System provides structural support for the body, maintaining its shape and protecting internal organs.

Q59: What is the main function of the digestive system? The main function of the digestive system is to break down food into simpler nutrients and absorb them into the blood for the body's use.

Q60: How does the body respond when the temperature rises above 37°C? When body temperature rises, the brain stimulates sweat glands to produce sweat, which cools the body via evaporation. Blood vessels also dilate to lose heat.

Q61: What system helps regulate body temperature? The Nervous system (detects change) works with the Integumentary system (sweat glands/skin) and Circulatory system (blood flow) to regulate body temperature.

Q62: How does the muscular system help in maintaining body posture? Skeletal muscles maintain a state of partial contraction (tone) even when at rest, which holds the skeleton in position and maintains body posture against gravity.

Q63: What is homeostasis, and why is it important for organisms? Homeostasis is the maintenance of a stable internal environment despite external changes. It is important because body cells and enzymes function best within specific narrow ranges of temperature and pH.

Q64: Define homeostasis. Homeostasis is defined as the ability of an organism to maintain a stable internal environment (such as temperature, pH, water balance) despite fluctuations in the external environment.

Q65: Describe the importance of homeostasis. Homeostasis ensures that cells function properly by keeping conditions like temperature and pH optimal. Without it, metabolic processes would fail, leading to illness or death.

Q66: How is the increase in blood glucose level controlled in the body? When blood glucose rises (e.g., after eating), the pancreas releases the hormone insulin. Insulin signals cells to take up glucose, lowering the blood sugar level back to normal.

Q67: How is the increased oxygen requirement fulfilled during hard exercise? During exercise, the breathing rate and heartbeat increase. This delivers more oxygen to the muscles and removes the excess carbon dioxide produced by increased metabolism.

Q68: Write down the role of the skeletal and muscular system in homeostasis. The muscular system generates heat through shivering to maintain body temperature. The skeletal system provides support and protects organs, while also storing minerals (calcium) to regulate blood levels.

Q69: Why is homeostasis important for the body? It keeps the internal environment (chemicals, temperature) stable so that complex cellular machinery and enzymes can work efficiently, ensuring the survival and health of the organism.

Q70: What is studied in biochemistry? Biochemistry is the study of chemical processes and substances within living organisms. It explores biomolecules like carbohydrates, proteins, and lipids and their metabolic reactions.

Q71: Describe the main functions of carbohydrates. Carbohydrates serve as the primary source of energy for cells (glucose). They also act as energy storage molecules (starch, glycogen) and provide structural support (cellulose in plants).

Q72: Describe the important functions of proteins. Proteins build cell structures (membranes), act as enzymes to catalyze reactions, transport substances (hemoglobin), defend the body (antibodies), and regulate functions (hormones).

Q73: Describe the important functions of lipids. Lipids store energy (fats), form the core structure of cell membranes (phospholipids), provide insulation, and protect organs.

Q74: Explain the important functions of DNA. DNA carries hereditary information that controls the development, functioning, and characteristics of organisms. It transmits genetic traits from parents to offspring.

Q75: Define Metabolism. Also write its types. Metabolism refers to all the chemical reactions occurring in an organism. It is divided into two types: Anabolism (building up molecules) and Catabolism (breaking down molecules).

Q76: Differentiate between anabolism and catabolism. Anabolism involves constructing complex molecules from simpler ones and requires energy. Catabolism involves breaking down complex molecules into simpler ones and releases energy.

Q77: How do the three groups of carbohydrates differ in taste? Monosaccharides are sweet in taste. Disaccharides are less sweet than monosaccharides. Polysaccharides are tasteless.

Q78: Name two common monosaccharides and two disaccharides. Common monosaccharides: Glucose and Fructose. Common disaccharides: Sucrose (table sugar) and Maltose.

Q79: Give an example of a storage Polysaccharide in plants. Starch is the primary storage polysaccharide in plants, found in crops like wheat, rice, and maize.

Q80: What is the primary function of carbohydrates in cells? The primary function is to serve as an immediate source of energy. Cells break down glucose during respiration to produce ATP for cellular activities.

Q81: Define monosaccharides. Monosaccharides are the simplest carbohydrates (simple sugars) consisting of a single sugar unit. They are soluble in water, sweet, and cannot be hydrolyzed further.

Q82: What is the general formula for carbohydrates? The general formula for carbohydrates is $(CH_2O)_n$, where 'n' represents the number of carbon atoms.

Q83: Compare the energy level of carbohydrates, proteins and lipids. Lipids store significantly more energy (double) per gram compared to carbohydrates and proteins. Carbohydrates are the primary quick energy source, while lipids are for long-term storage.

Q84: Write the general characteristics of monosaccharides. Monosaccharides are simple sugars, sweet in taste, easily soluble in water, and cannot be broken down into simpler sugars. They typically have 3 to 7 carbon atoms.

Q85: What are Cellulose and Chitin? Cellulose is a polysaccharide that forms the cell wall of plants. Chitin is a modified polysaccharide found in the cell walls of fungi and the exoskeletons of insects.

Q86: Define carbohydrates and write its types. Carbohydrates are "hydrated carbons" with a H:O ratio of 2:1. They are organic compounds classified into three types: Monosaccharides, Disaccharides, and Polysaccharides.

Q87: Write down the sources of carbohydrates. Sources include fruits, vegetables, and honey (monosaccharides); sugar cane, milk (disaccharides); and cereals like wheat, rice, maize, and potatoes (polysaccharides/starch).

Q88: Define amino acid and draw its structure. An amino acid is the monomer of proteins, consisting of a central carbon, an amino group (NH_2), a carboxyl group (COOH), a hydrogen, and a variable R-group.

Q89: What is the role of proteins in enzymes? Enzymes are made of proteins. They act as biological catalysts that speed up biochemical reactions in the body without being consumed.

Q90: What is the function of antibodies? Antibodies are specialized proteins produced by the immune system. They defend the body against harmful pathogens like bacteria and viruses.

Q91: What are the different plant sources of proteins? Plant sources of proteins include pulses, beans, nuts, and seeds.

Q92: Write the difference between essential and non-essential amino acids. Essential amino acids cannot be made by the body and must be obtained from food. Non-essential amino acids can be synthesized by the body.

Q93: Draw the general structure of amino acids Glycine and Alanine. (See structural diagrams in the original source document.)

Q94: What is hemoglobin? Write its function in blood. Hemoglobin is an iron-containing protein found in red blood cells. Its function is to transport oxygen from the lungs to body tissues.

Q95: What are the basic components of lipids? Draw their structures. Lipids are composed of glycerol and fatty acids. Glycerol is a 3-carbon alcohol ($\text{C}_3\text{H}_8\text{O}_3$). Fatty acids are long hydrocarbon chains with a carboxyl group (COOH).

Q96: How are unsaturated fatty acids different from saturated fatty acids? Saturated fatty acids have no double bonds and are solid at room temperature. Unsaturated fatty acids have one or more double bonds and are liquid at room temperature.

Q97: Why are lipids insoluble in water? Lipids are non-polar molecules, whereas water is polar. Since "like dissolves like," lipids do not dissolve in water but are soluble in organic solvents.

Q98: Differentiate between glycerol and fatty acids. Glycerol is a small alcohol molecule with 3 hydroxyl groups. Fatty acids are long chains of hydrocarbons with a carboxyl group at one end. They combine to form lipids.

Q99: Write the animal sources of lipids. Animal sources of lipids include meat, butter, cheese, ghee, and dairy products.

Q100: Write the botanical sources of lipids. Botanical (plant) sources of lipids include nuts, seeds, and oils such as olive oil, corn oil, and coconut oil.

Q101: Write the general structure of fats and oils. Fats and oils are triglycerides, formed by one glycerol molecule bonded to three fatty acid molecules.

Q102: Differentiate between fats and oils. Fats are typically solid at room temperature and contain saturated fatty acids (mostly animal source). Oils are liquid at room temperature and contain unsaturated fatty acids (mostly plant source).

Q103: What are the types of RNA? Write their functions. Types of RNA include mRNA (messenger), tRNA (transfer), and rRNA (ribosomal). mRNA carries genetic code to ribosomes. tRNA brings amino acids to ribosomes. rRNA helps build the ribosome structure.

Q104: Briefly describe the function of DNA. DNA stores hereditary information. It contains instructions for the development, function, and characteristics of the organism and passes traits to offspring.

Q105: What is the sugar in DNA called? The sugar present in DNA is called Deoxyribose.

Q106: What are the types of RNA? The three main types of RNA are messenger RNA (mRNA), transfer RNA (tRNA), and ribosomal RNA (rRNA).

Q107: What is transcription in the context of genetics? Transcription is the process where the genetic information in DNA is copied into a molecule of messenger RNA (mRNA). This is the first step in gene expression.

Q108: Define gene. A gene is a specific sequence of DNA that contains the instructions for making a particular protein or RNA molecule, thus controlling a specific trait.

Q109: Differentiate between transcription and translation. Transcription is the synthesis of RNA from DNA in the nucleus. Translation is the synthesis of proteins from RNA at the ribosomes in the cytoplasm.

Q110: Define transcription and translation. Transcription is the conversion of DNA information into mRNA. Translation is the process where ribosomes read the mRNA code to assemble amino acids into proteins.

Q111: Write a short note on budding in yeast. In yeast, budding is an asexual reproduction method. A small outgrowth (bud) forms on the parent cell. The nucleus divides, and one nucleus moves into the bud. The bud eventually detaches to form a new yeast cell.

Q112: Write a short note on spore formation in fungi. Fungi reproduce asexually by forming spores in sacs called sporangia. When mature, the sporangia burst, releasing spores. These spores are dispersed by wind and germinate into new fungi in favorable conditions.

Q113: Describe how vegetative propagation occurs through runners. Runners are horizontal stems that grow along the ground (e.g., Strawberry). At nodes, they produce roots and shoots. The new shoots develop into independent plants.

Q114: State how potatoes reproduce through tubers. Potatoes have underground stems called tubers which have "eyes" (buds). Each eye can sprout into a new plant (shoot and root), allowing vegetative reproduction.

Q115: Define reproduction and write its example. Reproduction is the biological process by which organisms produce new individuals of the same kind. Example: A cat giving birth to kittens or a plant producing seeds.

Q116: Differentiate between sexual and asexual reproduction. Asexual reproduction involves one parent and produces genetically identical offspring (clones). Sexual reproduction involves two parents, gamete fusion, and produces genetically diverse offspring.

Q117: What is binary fission? How do bacteria reproduce asexually by binary fission? Binary fission is the division of a single parent cell into two equal daughter cells. In bacteria, the DNA replicates, the cell elongates, and then divides in the center to form two new bacteria.

Q118: What is budding? Give examples of organisms which reproduce asexually by budding. Budding is a form of asexual reproduction where a new individual develops from a bud on the parent. Examples: Yeast (unicellular) and Hydra (multicellular).

Q119: What is the difference between spores and sporangia? Spores are the microscopic reproductive cells capable of developing into a new individual. Sporangia are the structures or sacs in which these spores are produced and stored.

Q120: What is meant by vegetative propagation in plants? Vegetative propagation is a type of asexual reproduction where new plants grow from vegetative parts of the parent plant, such as roots, stems, or leaves, rather than from seeds.

Q121: Write down the three methods of vegetative propagation. Methods include: 1. By Bulbs (e.g., Onion), 2. By Tubers (e.g., Potato), 3. By Runners (e.g., Strawberry). Also artificial methods like Cutting and Grafting.

Q122: What are bulbs? How do plants reproduce vegetatively by bulbs? Bulbs are short underground stems comprised of fleshy leaves (e.g., Onion). They contain stored food. New bulbs form from the base, which can grow into new plants.

Q123: What are corms? How do they help in reproduction? Corms are short, swollen underground stems. They store food and have buds. In the growing season, these buds develop into new shoots and plants.

Q124: What is a rhizome? Give an example. A rhizome is a horizontal underground stem with scale leaves and buds. New shoots can grow from the buds. Example: Ginger.

Q125: What is a stolon? How do they help in reproduction? Stolons (or runners) are stems that grow along the soil surface. They produce roots at nodes, allowing new plants to establish at a distance from the parent.

Q126: Differentiate between spore and endospore. A spore is a reproductive cell for dispersal (fungi/plants). An endospore is a tough, dormant structure formed inside some bacteria to survive harsh conditions, not primarily for reproduction.

Q127: Describe the advantages and disadvantages of vegetative propagation. Advantages: Faster reproduction, offspring are identical (preserving good traits), only one parent needed. Disadvantages: No genetic variation, diseases spread to all offspring, potential overcrowding.

Q128: Differentiate between: (i) **Asexual and Sexual reproduction:** (See Q116). (ii) **Binary fission in bacteria and amoeba:** Bacteria are prokaryotic (no nucleus); Amoeba are eukaryotic (nucleus divides by mitosis). (iii) **Stolon and Rhizome:** Stolon is above ground; Rhizome is underground. (iv) **Bulb and Corm:** Bulb is fleshy leaves; Corm is solid stem tissue. (v) **Cutting and Grafting:** Cutting plants a piece to grow roots; Grafting joins two plant parts. (vi) **Male and Female gametophytes:** Male produces sperm (pollen); Female produces egg (embryo sac). (vii) **Calyx and Corolla:** Calyx (sepals, green); Corolla (petals, colored). (viii) **Stamen and Carpel:** Stamen is male part (anther+filament); Carpel is female part (stigma+style+ovary).

Q129: What are the disadvantages of vegetative propagation? Since plants are genetically identical, if a disease attacks one, it can wipe out the entire crop. There is also no genetic evolution or adaptation to changing environments.

Q130: What is grafting? Grafting is an artificial propagation method where a branch (scion) of one plant is attached to the stem (stock) of another, so they grow as one plant.

Q131: Write the uses of grafting. Grafting is used to propagate plants that don't produce seeds (seedless grapes), to combine good traits (e.g., good fruit with strong roots), and to speed up fruiting.

Q132: Name the four whorls present in a flower and also tell the components of each whorl.

1. Calyx (Sepals)
2. Corolla (Petals)
3. Androecium (Stamens - male)
4. Gynoecium (Carpels - female)

Q133: Briefly describe the formation of the egg cell and polar nuclei within the embryo sac of a flower. Inside the ovule, a cell undergoes meiosis to form spores. One spore divides by mitosis to form the embryo sac, which contains the haploid egg cell and two central polar nuclei.

Q134: Differentiate between sporophyte generation and gametophyte generation. The sporophyte generation is diploid ($2n$) and produces spores by meiosis. The gametophyte generation is haploid (n) and produces gametes (sperm/egg) by mitosis.

Q135: What is gynoecium? Gynoecium is the female reproductive whorl of the flower, consisting of units called carpels (or pistils). Each carpel has an ovary, style, and stigma.

Q136: Define calyx. Calyx is the outermost whorl of a flower, consisting of green leaf-like structures called sepals. It protects the flower when it is in the bud stage.

Q137: What is Androecium? Androecium is the male reproductive whorl of the flower, consisting of units called stamens. Each stamen has a filament and an anther (which produces pollen).

Q138: Write the name of the four whorls present in a flower. The four whorls are: Calyx, Corolla, Androecium, and Gynoecium.

Q139: Define pollination. Pollination is the transfer of pollen grains from the anther (male part) to the stigma (female part) of a flower.

Q140: Difference between self and cross pollination. Self-pollination is the transfer of pollen within the same flower or plant. Cross-pollination is the transfer of pollen to a flower on a different plant of the same species.

Q141: What is meant by fertilization? Fertilization is the fusion of the male gamete (sperm) with the female gamete (egg) to form a zygote.

Q142: Define double fertilization. Double fertilization is a unique process in flowering plants where one sperm fertilizes the egg (forming a zygote) and another sperm fuses with the two polar nuclei (forming endosperm).

Q143: Define parthenocarpy. Parthenocarpy is the development of a fruit without fertilization. Such fruits are typically seedless (e.g., bananas).

Q144: Differentiate between self-pollination and cross-pollination. Self-pollination maintains genetic purity but limits variation. Cross-pollination introduces genetic variation and healthier offspring but depends on external agents like wind or insects.

Q145: What is meant by stigma and style? The stigma is the sticky top part of the carpel that catches pollen. The style is the tube connecting the stigma to the ovary, through which the pollen tube grows.

Q146: How are seeds and fruits formed? After fertilization, the ovule develops into a seed (containing the embryo), and the surrounding ovary wall ripens to form the fruit.

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Short Questions No. 4

Q1: Define metabolism. Differentiate between catabolism and anabolism. Metabolism is the set of all biochemical reactions that occur in living organisms to maintain life. It is divided into two types: Anabolism includes constructive reactions where smaller molecules combine to form complex molecules (requiring energy, e.g., photosynthesis). Catabolism includes destructive reactions where complex molecules are broken down into simpler ones (releasing energy, e.g., respiration).

Q2: Define lipolysis and cellular respiration. Lipolysis is the metabolic process through which triacylglycerols (lipids) break down via hydrolysis into their constituent molecules: glycerol and free fatty acids. Cellular Respiration is the process in which the C-H bonds in food (like glucose) are broken by oxidation-reduction reactions to release energy, which is then transformed into ATP.

Q3: Define an enzyme. What is its role in metabolism? Enzymes are proteins that act as biological catalysts. Their role in metabolism is to speed up and regulate biochemical reactions without being consumed in the process. They lower the activation energy required for reactions to proceed, making metabolic pathways efficient enough to sustain life.

Q4: What is the active site of an enzyme? State its importance in enzyme specificity. The active site is a specific region on the enzyme's surface where the substrate binds and catalysis takes place. It has a specific shape and charge distribution that allows only a specific substrate to bind to it (like a key fits a lock). This precise fit is what gives enzymes their specificity, ensuring they only catalyze one type of reaction.

Q5: Why are enzymes called biological catalysts? Enzymes are called biological catalysts because they are produced by living cells ("biological") and they speed up the rate of biochemical reactions ("catalysts") without being used up or permanently changed. They allow reactions to occur at speeds necessary for life under normal body temperatures.

Q6: Define co-factors. Give two examples. Some enzymes require a non-protein molecule or ion to function properly; this non-protein part is called a cofactor. Cofactors can be inorganic ions or organic molecules. Examples include metal ions (activators) and organic molecules like NAD⁺ (coenzymes).

Q7: What do you mean by saturation of active sites? Saturation of active sites occurs when all the active sites of the available enzyme molecules are occupied by substrate molecules. At this point, increasing the substrate concentration further will not increase the rate of reaction because there are no free enzymes left to bind with the additional substrate.

Q8: Write the difference between catalyst and enzyme. A catalyst is any substance (often inorganic) that speeds up a chemical reaction but remains unchanged. An enzyme is a specific type of catalyst that is biological in origin (usually a protein) and works within living organisms to speed up metabolic reactions with high specificity.

Q9: Write the difference between intracellular and extracellular enzymes. Intracellular enzymes function inside the cell where they are synthesized (e.g., enzymes of glycolysis in the cytoplasm). Extracellular enzymes are secreted out of the cell to perform their function outside (e.g., pepsin works in the stomach cavity to digest proteins).

Q10: Describe characteristics of enzymes. Enzymes are proteins that act as catalysts. They are highly specific, reacting only with specific substrates. They are sensitive to temperature and pH. They require an aqueous environment to function. Their activity can be regulated by inhibitors or activators, and they lower the activation energy of reactions.

Q11: Differentiate between intracellular and extracellular enzymes. Intracellular enzymes work within the cell (e.g., in mitochondria for respiration), while extracellular enzymes work outside the cell (e.g., digestive enzymes like amylase in the oral cavity).

Q12: Differentiate between prosthetic groups and coenzymes. Both are types of organic cofactors. A prosthetic group is covalently (tightly) bonded to the enzyme (e.g., heme in hemoglobin). A coenzyme is loosely attached to the enzyme and can detach after the reaction (e.g., vitamins like NAD⁺).

Q13: Write down the uses of enzymes in the fermentation industry. In the fermentation industry, enzymes are used to break down starch and sugars to produce products like alcohol (ethanol) in brewing. Yeast enzymes ferment sugars to produce carbon dioxide for raising bread dough in baking.

Q14: Provide an example of a specific enzyme-substrate pair. A common example is the enzyme Amylase and its substrate Starch. Amylase specifically binds to starch molecules and breaks them down into simpler sugars (maltose), but it will not react with proteins or fats.

Q15: Describe the lock and key model of enzyme action. Proposed by Emil Fischer, the Lock and Key model states that the active site of an enzyme is a rigid structure. The substrate fits into this active site exactly like a specific key fits into a lock. This model explains enzyme specificity but does not account for the flexibility of enzymes.

Q16: What are active sites? Write their function. Active sites are the specific regions on an enzyme surface formed by the folding of the protein chain. Their function is to bind the substrate molecules and provide the catalytic site where the chemical reaction takes place to convert substrate into product.

Q17: Who presented the lock and key model? The Lock and Key model of enzyme action was presented by the German chemist Emil Fischer in 1894 to explain why enzymes are specific to their substrates.

Q18: Who proposed the induced fit model? The Induced Fit model was proposed by Daniel Koshland in 1958. This model suggests that the active site is not rigid but flexible, modifying its shape to fit the substrate more effectively.

Q19: What is the effect of substrate concentration on enzyme activity? Initially, increasing substrate concentration increases the rate of enzyme activity because more active sites are occupied. However, once all active sites are saturated (occupied), further increasing substrate concentration has no effect on the rate of reaction.

Q20: What do you mean by optimum temperature and pH? Optimum temperature is the specific temperature at which an enzyme works at its maximum rate (e.g., 37°C for human enzymes). Optimum pH is the specific pH value at which an enzyme is most active (e.g., pH 2 for pepsin). Any deviation reduces activity.

Q21: Which protein-digesting enzyme functions in an acidic medium? Pepsin is the protein-digesting enzyme that functions in an acidic medium. It is found in the stomach and works best at a low pH (around 1.5 to 2.0).

Q22: How does pH affect enzyme activity? Every enzyme has an optimum pH. A change in pH can change the ionization of the amino acids at the active site. This may alter the shape of the enzyme or its ability to bind to the substrate, reducing or stopping its catalytic activity (denaturation).

Q23: Describe the factors that affect the activity of enzymes. The main factors affecting enzyme activity are: 1. Temperature (rate increases until optimum, then drops due to denaturation), 2. pH (specific range required), 3. Substrate concentration (increases rate until saturation), and 4. Enzyme concentration.

Q24: Which type of enzyme inhibitors inhibit the enzymes without attaching to the active site? Non-competitive inhibitors are the type that bind to a site other than the active site (allosteric site). This binding alters the overall shape of the enzyme, making the active site less effective or unable to catalyze the reaction.

Q25: Differentiate between competitive and non-competitive inhibition. Competitive inhibitors structurally resemble the substrate and compete for the active site, blocking it temporarily. Non-competitive inhibitors bind to a different part of the enzyme, changing its shape so the active site no longer functions, regardless of substrate concentration.

Q26: What is enzyme inhibition? Write its types. Enzyme inhibition is a process where a molecule (inhibitor) binds to an enzyme and decreases its activity. The two main types are Irreversible inhibition (permanent damage) and Reversible inhibition (which is further divided into Competitive and Non-competitive).

Q27: Write the importance of oxidation-reduction reactions. Oxidation-reduction (Redox) reactions are crucial for energy flow in living systems. They involve the exchange of electrons (and often hydrogen). In respiration, these reactions break down food to release energy stored in chemical bonds, which is captured in ATP.

Q28: What do ATP and ADP mean? What are the roles of these molecules in cellular metabolism? ATP stands for Adenosine Triphosphate, and ADP stands for Adenosine Diphosphate. ATP is the "energy currency" of the cell, storing energy in its phosphate bonds. When energy is needed, ATP converts to ADP, releasing energy for metabolic activities.

Q29: What do you know about redox reactions? A redox reaction involves the transfer of electrons between two substances. Oxidation is the loss of electrons (or hydrogen), while Reduction is the gain of electrons (or hydrogen). These reactions are central to photosynthesis and respiration.

Q30: Define Bioenergetics. Bioenergetics is the study of energy relationships and energy transformations (conversions) in living organisms. It involves the study of how organisms obtain, process, and use energy for biological work.

Q31: Write a short note on ATP. ATP (Adenosine Triphosphate) is the main energy-carrying molecule in all living cells. It was discovered in 1929. It stores chemical energy in two high-energy phosphate bonds.

When the terminal bond is broken, a significant amount of energy (7.3 kcal/mol) is released for cellular use.

Q32: What are the subunits of ATP? The ATP molecule consists of three subunits: 1. A nitrogenous base called Adenine, 2. A five-carbon sugar called Ribose, and 3. A chain of three Phosphate groups.

Q33: How do living beings obtain energy and for what purposes do they use it? Living beings obtain energy by metabolizing food (breaking chemical bonds in glucose) via respiration. They use this energy for various life processes such as active transport, movement, synthesis of macromolecules, reproduction, and maintaining body temperature.

Q34: Why is chlorophyll important for photosynthesis? Chlorophyll is a green pigment found in chloroplasts that absorbs light energy (mainly blue and red wavelengths) from the sun. This absorbed energy is essential to drive the light-dependent reactions of photosynthesis, converting light energy into chemical energy.

Q35: How is oxygen produced during photosynthesis? Oxygen is produced during the Light Reactions of photosynthesis. It is a by-product of the photolysis of water, where water molecules are split by light energy into hydrogen ions, electrons, and oxygen gas (O₂).

Q36: Which organisms carry out photosynthesis? Which cell organelle is responsible for the absorption of light for photosynthesis? Photosynthesis is carried out by plants, algae, and some bacteria (cyanobacteria). In eukaryotic cells (plants and algae), the Chloroplast is the organelle responsible for absorbing light, specifically using the pigment chlorophyll found in its thylakoid membranes.

Q37: Define photosynthesis and write its equation. Photosynthesis is the process by which autotrophs synthesize food (glucose) from carbon dioxide and water using sunlight and chlorophyll, releasing oxygen as a by-product. Equation: $6\text{CO}_2 + 6\text{H}_2\text{O} + \text{Light Energy} \xrightarrow{(\text{Chlorophyll})} \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$

Q38: Differentiate between light reaction and dark reaction. Light Reaction occurs in the thylakoid membranes, depends directly on light, and produces ATP and NADPH. Dark Reaction (Calvin Cycle) occurs in the stroma, does not require light directly, and uses ATP and NADPH to reduce CO₂ into glucose.

Q39: What is the role of water during the light reaction? Water is split (photolysis) to provide electrons to replace those lost by chlorophyll. It also provides hydrogen ions for the production of NADPH and releases oxygen as a by-product essential for life.

Q40: Write a short note on the dark reaction. The Dark Reaction, or Calvin Cycle, takes place in the stroma of chloroplasts. It uses the chemical energy stored in ATP and NADPH (from light reactions) to fix carbon dioxide. Through a series of reactions, CO₂ is converted into glucose.

Q41: Define pigments. Give examples. Pigments are substances that absorb visible light. Different pigments absorb different wavelengths of light. Examples include Chlorophyll a (main photosynthetic pigment), Chlorophyll b, and Carotenoids (accessory pigments).

Q42: Explain the absorption of sunlight by pigments. Pigments absorb specific wavelengths of light. Chlorophylls mainly absorb blue and red light, which are most effective for photosynthesis, and reflect

green light. Carotenoids absorb violet and blue-green light, broadening the spectrum of light that can drive photosynthesis.

Q43: Write the equation of: (a) photosynthesis (b) fermentation (c) aerobic respiration. (a)

Photosynthesis: $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$ (b) Alcoholic Fermentation: $\text{C}_6\text{H}_{12}\text{O}_6 \rightarrow 2\text{C}_2\text{H}_5\text{OH} + 2\text{CO}_2 + \text{Energy}$ (c) Aerobic Respiration: $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} + \text{Energy (ATP)}$

Q44: What are NAD and NADP? NAD (Nicotinamide Adenine Dinucleotide) and NADP (Nicotinamide Adenine Dinucleotide Phosphate) are coenzymes that act as electron carriers. They accept electrons and hydrogen ions to become NADH and NADPH, transporting energy in redox reactions.

Q45: How is NADPH formed in the light reaction? During the light reaction, electrons travel through an electron transport chain and are finally accepted by NADP^+ . Simultaneously, hydrogen ions (H^+) from the splitting of water combine with NADP^+ and electrons to reduce it to NADPH.

Q46: Define anaerobic and aerobic respiration. Aerobic respiration is the breakdown of glucose in the presence of oxygen to release a large amount of energy (CO_2 and water are products). Anaerobic respiration (fermentation) is the breakdown of glucose in the absence of oxygen, releasing a small amount of energy.

Q47: What are the end products of anaerobic respiration in animals and yeast? In animals (skeletal muscles), the end product is Lactic Acid. In yeast, the end products are Ethyl Alcohol (Ethanol) and Carbon Dioxide.

Q48: How do muscles respond to oxygen deficiency during intense exercise? During intense exercise, when oxygen supply is insufficient for aerobic respiration, muscle cells switch to Lactic Acid Fermentation (anaerobic respiration). This allows them to produce a small amount of ATP to continue contracting, resulting in lactic acid accumulation.

Q49: Define cellular respiration. Cellular respiration is the oxidative process occurring within cells where organic food molecules (like glucose) are broken down to release energy. This energy is then trapped in the form of ATP for cellular use.

Q50: Write a short note on aerobic respiration. Aerobic respiration requires oxygen to completely oxidize glucose. It occurs in the mitochondria (specifically the Krebs cycle and Electron Transport Chain). It produces a high yield of ATP (approx. 36-38 per glucose) along with carbon dioxide and water as waste products.

Q51: Write a short note on anaerobic respiration. Anaerobic respiration occurs without oxygen. It takes place in the cytoplasm and involves incomplete oxidation of glucose. It produces very little energy (2 ATP) and by-products like lactic acid or alcohol. It is crucial for survival in low-oxygen environments.

Q52: Differentiate between alcoholic and lactic acid fermentation. Alcoholic Fermentation produces ethanol and CO_2 (common in yeast/bread making). Lactic Acid Fermentation produces lactic acid only (common in muscle cells during exercise and in bacteria for yogurt making).

Q53: Explain the importance of fermentation. Fermentation is evolutionarily important as it allows organisms to generate energy when oxygen is absent. It is also economically important for humans in the production of bread, alcohol, yogurt, cheese, and soy sauce through the action of microorganisms.

Q54: What is the Krebs cycle? The Krebs cycle (or Citric Acid Cycle) is the second stage of aerobic respiration taking place in the mitochondrial matrix. Here, Pyruvate is completely oxidized into Carbon Dioxide, producing ATP, NADH, and FADH₂.

Q55: What is the electron transport chain? The Electron Transport Chain (ETC) is the final stage of aerobic respiration located in the inner mitochondrial membrane. Electrons from NADH and FADH₂ are passed along a series of carriers, releasing energy used to generate a large amount of ATP. Oxygen acts as the final acceptor to form water.

Q56: Differentiate between aerobic and anaerobic respiration. Aerobic respiration uses oxygen, breaks glucose completely, produces large energy, and occurs in mitochondria. Anaerobic respiration does not use oxygen, breaks glucose partially, produces small energy, and occurs in the cytoplasm.

Q57: Differentiate between photosynthesis and respiration. Photosynthesis is an anabolic process that stores energy (makes glucose) and releases oxygen; it occurs in chloroplasts. Respiration is a catabolic process that releases energy (breaks glucose) and consumes oxygen; it occurs in mitochondria.

Q58: Define aerobic respiration. It is the process of producing cellular energy involving oxygen, where glucose is completely broken down into carbon dioxide and water.

Q59: What is alcoholic fermentation? Alcoholic fermentation is a type of anaerobic respiration where glucose is broken down into pyruvic acid, which is then converted into ethyl alcohol (ethanol) and carbon dioxide. It is commonly carried out by yeast.

Q60: Define aerobic respiration. (See Q58)

Q61: Write about the importance of fermentation in daily life. In daily life, fermentation is used to bake bread (yeast raises dough), make yogurt and cheese (bacteria), preserve foods (pickles), and produce beverages. It is also the source of energy for muscles during sudden strenuous activity.

Q62: Define macronutrients and micronutrients and give examples. Macronutrients are nutrients required by plants in large quantities (e.g., Carbon, Nitrogen, Magnesium). Micronutrients are required in small quantities (e.g., Iron, Boron, Zinc). Both are essential for normal growth.

Q63: Differentiate between autotrophic and heterotrophic organisms. Autotrophic organisms (e.g., plants) can synthesize their own organic food from inorganic substances using light or chemical energy. Heterotrophic organisms (e.g., animals) cannot make their own food and must consume other organisms for nutrition.

Q64: Define nutrition and nutrients. Nutrition is the process by which an organism obtains and uses food. Nutrients are the elements and compounds that an organism obtains from its environment that are required for energy, growth, and survival.

Q65: Describe the role of calcium and magnesium in plant life. Calcium is essential for maintaining cell wall structure and membrane permeability. Magnesium is a central component of the chlorophyll molecule (necessary for photosynthesis) and is also important for enzyme function.

Q66: Describe the role of iron and molybdenum in plant life. Iron is necessary for chlorophyll synthesis and acts as a cofactor for enzymes in photosynthesis and respiration. Molybdenum is a component of the enzyme nitrate reductase, which is essential for nitrogen fixation and metabolism.

Q67: Describe the role of boron and manganese in plant life. Boron is important for sugar transport, cell division, and synthesizing certain enzymes. Manganese is involved in enzyme activity for photosynthesis, respiration, and nitrogen metabolism.

Q68: Differentiate between pith and cortex. In a stem/root section, the Cortex is the tissue layer between the epidermis and vascular bundles, used for storage. The Pith is the central soft tissue inside the ring of vascular bundles, also used for storage and support.

Q69: Write down the functions of root hairs. Root hairs are tiny extensions of root epidermal cells. Their main function is to greatly increase the surface area of the root system to maximize the absorption of water and mineral salts from the soil.

Q70: Differentiate between epidermis and endodermis. Epidermis is the outermost protective layer of cells on roots, stems, and leaves. Endodermis is the innermost layer of the cortex (specifically in roots) that regulates the flow of water and minerals into the vascular cylinder.

Q71: Define transpiration and its types. Transpiration is the loss of water in the form of vapours from the aerial parts of a plant. Its types are: 1. Stomatal transpiration (through stomata, 90%), 2. Cuticular transpiration (through cuticle), and 3. Lenticular transpiration (through lenticels).

Q72: Transpiration is the loss of water from plants. Is it a harmful phenomenon? If no, what is its importance? It is called a "necessary evil." While it causes water loss (risk of wilting), it is not purely harmful because it creates the transpirational pull required to transport water and minerals from roots to leaves and provides a cooling effect to the plant.

Q73: Differentiate between: (i) **Xylem and Phloem:** Xylem transports water/minerals; Phloem transports food. (ii) **Transpiration and Guttation:** Transpiration is loss of water vapour; Guttation is loss of liquid water drops from leaf tips. (iii) **Hydrophytes and Halophytes:** Hydrophytes live in fresh water; Halophytes live in salty water. (iv) **Hydrophytes and Xerophytes:** Hydrophytes live in water; Xerophytes live in dry deserts. (v) **Lenticular and Stomatal:** Lenticular is through woody stem pores; Stomatal is through leaf pores.

Q74: What is the effect of temperature on the rate of transpiration? The rate of transpiration increases with an increase in temperature because higher temperatures increase the evaporation of water from cell surfaces and open the stomata wider, accelerating water loss.

Q75: How is transpiration affected by surface area? Transpiration is directly proportional to the surface area of the leaves. Plants with broad leaves have a larger surface area and more stomata, resulting in a higher rate of transpiration compared to plants with small or needle-like leaves.

Q76: Define transpirational pull. Transpirational pull is the suction force generated in the xylem vessels due to the evaporation of water from the leaves (transpiration). This force pulls the water column upwards from the roots to the leaves.

Q77: Name the factors that affect the rate of transpiration. The factors include: 1. Light (stomata open in light), 2. Temperature, 3. Humidity (inversely proportional), 4. Wind speed, and 5. Soil water availability.

Q78: What is guttation? How is it different from dew? Guttation is the exudation of drops of liquid water from the tips or margins of leaves through hydathodes. It differs from dew because dew is condensation of water from the air onto the leaf surface, while guttation water comes from inside the plant.

Q79: How is the transpirational pull important in plants? Transpirational pull is the primary force responsible for the ascent of sap (water and minerals) from roots to the top of tall trees. Without it, water transport against gravity would be impossible.

Q80: Define the term Adhesion. Adhesion is the attractive force between water molecules and the walls of the xylem vessels (cellulose). This helps prevent the water column from breaking and aids in climbing up the tube.

Q81: Define the term Cohesion. Cohesion is the attractive force between water molecules themselves (due to hydrogen bonding). This allows water to form a continuous, unbroken chain or column inside the xylem.

Q82: Differentiate between guard cells and epidermal cells. Guard cells are bean-shaped, contain chloroplasts, and regulate the opening/closing of stomata. Epidermal cells are irregular in shape, lack chloroplasts (usually), and serve primarily for protection.

Q83: Differentiate between sink and source. In translocation, the Source is the area where food (sugar) is produced (e.g., leaves). The Sink is the area where food is stored or utilized (e.g., roots, fruits, growing tips). Food moves from source to sink.

Q84: Define Endodermis and pericycle. Endodermis is the layer of cells surrounding the vascular tissue in roots, acting as a checkpoint for water. Pericycle is a layer of cells just inside the endodermis from which lateral roots originate.

Q85: Describe the pressure flow mechanism. The Pressure Flow Mechanism explains food transport in phloem. Sugar is actively loaded into phloem at the source, water follows by osmosis creating high pressure. At the sink, sugar is removed, water leaves, creating low pressure. This pressure difference drives the flow of sap.

Q86: What is the pattern of gas exchange between plant and environment at the time of dawn and dusk? At dawn and dusk (low light), the rate of photosynthesis equals the rate of respiration. The oxygen produced by photosynthesis is used for respiration, and the produced CO₂ by respiration is used for photosynthesis. Thus, there is little to no net gas exchange with the environment.

Q87: Why do plants absorb carbon dioxide and release oxygen during daytime? During the day, the rate of photosynthesis is higher than respiration. Plants rapidly consume CO₂ for making food and produce surplus oxygen. Therefore, they absorb CO₂ from the air and release the excess oxygen.

Q88: What do you know about lenticels? Lenticels are small, raised pores found on the bark of woody stems and mature roots. They consist of loose cells that allow for the exchange of gases (oxygen and carbon dioxide) and some transpiration between the internal tissues and the atmosphere.

Q89: How do the plants of rubber and keekar excrete their wastes? These plants excrete wastes in the form of secretions. The Rubber plant secretes latex (a milky fluid). The Keekar (Acacia) secretes gum. These secretions contain accumulated waste products.

Q90: Name some waste products of plants. Common plant waste products include Oxygen (from photosynthesis), Carbon dioxide and Water (from respiration), Latex, Resins, Gums, and crystals of Calcium Oxalate (stored in leaves/fruits).

Q91: Define excretion. Excretion is the biological process of eliminating metabolic waste products (like nitrogenous wastes, excess water, salts) from the body to maintain homeostasis. In plants, this includes losing leaves or secreting chemicals.

Q92: How is homeostasis maintained in plants? Plants maintain homeostasis by regulating water and salt levels (osmoregulation) and removing metabolic wastes (excretion). They use mechanisms like transpiration to cool down, storing wastes in falling leaves, and adjusting solute concentrations in vacuoles.

Q93: Write any three osmotic adjustments in hydrophytes. Hydrophytes (water plants) adapt by: 1. Having a large surface area for floating and transpiration, 2. Possessing many stomata on the upper surface to remove excess water, and 3. Having little or no cuticle.

Q94: Define mesophytes. Give their two osmotic adjustments. Mesophytes are plants living in moderate water availability (e.g., Rose, Mango). Adjustments: 1. Stomata open in sufficient water supply to promote transpiration. 2. Stomata close in restricted supply to conserve water.

Q95: Write any three osmotic adjustments in halophytes. Halophytes (saltwater plants) adapt by: 1. Actively transporting salts into their vacuoles. 2. Maintaining a hypertonic internal environment to draw water in from the salty soil. 3. Having glands to excrete excess salts.

Q96: Define succulent organs. Succulent organs are fleshy, water-storing stems or leaves found in Xerophytes (desert plants like Cacti). They store large amounts of water in specialized parenchyma tissues to survive during dry periods.

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