SCIENCE-7

Chapter 1: Nutrition in Plants

A.	1. (c)	2. (a)	3. (c)	4. (d)	5. (b)
B.	1. F	2. F	3. T	4. T	5. T
C.	1. Chlorophyll	2. energy	3. starch	4. Cacti	5. soil

D.
1. A parasite feeds on living hosts and harms them, while saprotrophs feed on dead or decaying organic material.
2. Some plants lack chlorophyll and the necessary mechanisms to perform photosynthesis, making them dependent on other organisms for food.
3. Algae are typically autotrophic, performing photosynthesis to create their own food from light, water, and carbon dioxide.
4. Both are fungi that use saprophytic nutrition, feeding on and decomposing organic matter.
5. Photosynthesis requires sunlight, water, carbon dioxide, and chlorophyll.

E.
1. Leaves are essential to the photosynthesis process as they contain chlorophyll, a pigment that absorbs sunlight. This sunlight energy is then used to convert carbon dioxide and water into glucose and oxygen, which are crucial for the plant's growth and development. The structure of leaves, with their broad surface area and stomata for gas exchange, optimizes their ability to capture light and facilitate this energy transformation.
2. Symbiosis refers to a mutually beneficial relationship between two different organisms living in close physical proximity. An example of this is the relationship between fungi and algae forming lichens. In this symbiosis, algae produce food through photosynthesis which feeds the fungus, while the fungus provides protection and access to nutrients for the algae, enabling both to survive in harsh environments where neither could alone.
3. The leaves of the pitcher plant are uniquely adapted to trap insects to supplement the plant's nutrient intake. These leaves have evolved into deep, slippery pitchers filled with digestive enzymes. Insects attracted to the pitcher's nectar fall into the trap and cannot escape due to the pitcher's slippery walls and downward-pointing hairs, ultimately being digested by the plant.
4. Saprophytes, like fungi and bacteria, play a critical role in decomposing dead organic matter, breaking it down into simpler substances that can be reabsorbed as nutrients by other plants. This process of decomposition helps clean the environment by recycling nutrients and preventing the accumulation of dead material, thereby maintaining ecological balance.
5. Farmers often grow leguminous crops after cereals to naturally replenish soil nitrogen levels. Legumes host nitrogen-fixing bacteria in their root nodules, which convert atmospheric nitrogen into forms usable by plants. This natural enrichment of the soil reduces the need for chemical fertilizers, promoting sustainable agriculture and improving soil fertility for future crops.

Chapter 2: Nutrition in Animals

A.	1. (a)	2. (c)	3. (a)	4. (b)	5. (c)
B.	1. F	2. F	3. T	4. T	5. F
C.	1. utilised	2. process	3. 9–10	4. ingestion	5. Liver

D. 1. **Incisors:** Used for cutting and biting.

Canines: Used for tearing and ripping.

Premolars: Broad and flat, used for crushing and grinding.

Molars: Larger and stronger than premolars, used for intensive grinding.

2. Ruminants have a specialized stomach with multiple chambers and a microbial environment that breaks down cellulose through fermentation. Humans lack this specialized structure and the necessary microbes.
3. Assimilation is the process by which the body utilizes and absorbs digested food molecules, incorporating them into body tissues for energy, growth, and cell repair.
4. Pancreatic juices contain enzymes that break down carbohydrates, proteins, and fats into simpler molecules, aiding in the digestion and absorption of nutrients.
5. The epiglottis, a flap-like structure, covers the entrance to the windpipe during swallowing, preventing food from entering the respiratory tract.

E. 1. Villi are tiny, finger-like projections found along the inner walls of the small intestine. They increase the surface area for absorption, enhancing the uptake of nutrients into the bloodstream. Each villus contains blood vessels and a lymph vessel (lacteal) which absorb digested fats and other nutrients, effectively transporting them throughout the body.

2. The human tongue is a muscular organ located in the mouth, pivotal for various functions. It assists in chewing by manipulating food, aids in swallowing, and is essential for speech. The tongue is covered with taste buds that detect sweet, sour, salty, and bitter tastes, contributing to the sense of taste.
3. Amoebas digest food through a process called phagocytosis. They extend pseudopods to encircle a food particle, forming a food vacuole. Digestive enzymes are then secreted into the vacuole, breaking down the food into absorbable nutrients, which diffuse into the cytoplasm. The indigestible residue is expelled through the cell membrane.
4. Bile is a digestive fluid produced by the liver and stored in the gallbladder. It is released into the small intestine where it emulsifies fats, breaking them into smaller droplets that enzymes can more easily digest. Bile also aids in the absorption of fat-soluble vitamins and helps eliminate waste products from the body.
5. Ruminants such as cows and sheep have a complex stomach divided into four compartments: the rumen, reticulum, omasum, and abomasum. They initially chew food lightly and swallow it into the rumen and reticulum where microbial fermentation breaks down cellulose. The cud (partially digested food) is then regurgitated, re-chewed, and swallowed again for further digestion in the omasum and abomasum, where enzymes break down proteins and other nutrients.

Chapter 3: Heat

A.	1. (c)	2. (a)	3. (d)	4. (c)	5. (a)
B.	1. F	2. F	3. T	4. T	5. T
C.	1. clinical	2. 37°C	3. thermometer	4. solids	5. Temperature

D. 1. Heat is a form of energy that is transferred between objects or substances based on their temperature difference. It flows from a hotter object to a cooler one until thermal equilibrium is reached.

2. The three modes of heat transfer are conduction, convection, and radiation.
3. Conductors are materials that allow heat and electricity to pass through them easily (e.g., metals), whereas insulators resist heat and electrical flow (e.g., wood, plastic).

4. The kink in the capillary of a clinical thermometer prevents the mercury from flowing back into the bulb immediately after measuring the temperature, allowing the user to read the temperature without rapid changes.
5. We jerk a clinical thermometer before use to ensure that the mercury level falls below the minimum temperature scale, providing an accurate reading for the next use.

E. 1. To demonstrate conduction in solids, you can perform an experiment using a metal rod and some small wax pieces. Attach the wax pieces at intervals along the rod. Heat one end of the rod over a flame. As the rod heats up, observe how the heat travels along the rod, melting the wax pieces progressively farther from the heat source. This experiment shows how heat is transferred through the solid metal by conduction.

2. Conduction is the transfer of heat through direct contact between molecules, common in solids. Convection occurs in fluids (liquids or gases), where warmer, less dense parts of a fluid rise, and cooler, denser parts sink, creating a heat transfer cycle. Radiation involves the transfer of heat through electromagnetic waves, such as the heat from the sun reaching Earth. It does not require any medium for transfer.
3. When reading a clinical thermometer, ensure it is clean and sanitized. Shake the thermometer so that the mercury falls below the minimum temperature scale. Place it correctly under the tongue and keep the mouth closed for a more accurate reading. After use, clean the thermometer with antiseptic. Read the thermometer at eye level to avoid parallax errors and get an accurate measure.
4. Land and sea breezes are produced by temperature differences between land and water bodies. During the day, land heats up faster than water, causing the air above it to warm and rise. Cooler air from the sea moves in to replace it, creating a sea breeze. At night, the land cools quicker than the sea, and the air above the sea is warmer and rises, causing cooler land air to move towards the sea, creating a land breeze.
5. In summers, wear light-colored, loose-fitting clothes made of materials like cotton that reflect sunlight and allow the body to cool efficiently through evaporation of sweat. In winters, opt for dark-colored, tighter woven clothes made from wool or synthetic fibers that absorb and retain heat, keeping the body warm by reducing heat loss to the surrounding colder air.

Chapter 4: Acids, Bases and Salts

A.	1. (d)	2. (c)	3. (a)	4. (b)
B.	1. F	2. T	3. F	4. T
C.	1. water	2. Turmeric	3. neutralisation	4. Farmers

D. 1. Acids are substances that donate protons (H+) or accept electrons and have a pH less than 7. They taste sour and turn blue litmus red. Bases are substances that accept protons or donate electrons and have a pH greater than 7. They feel soapy, taste bitter, and turn red litmus blue.

2. The nature of window cleaners that turn red litmus blue is basic.
3. NaOH (sodium hydroxide) + HCl (hydrochloric acid) $\rightarrow$ NaCl (sodium chloride or salt) + H_2O (water)
4. An indicator is a substance that changes color in the presence of an acid or base, used to determine the acidity or basicity of a solution. Examples include litmus (natural) and phenolphthalein (synthetic).

E. 1. Strong and weak acids differ primarily in their ability to dissociate in water. A strong acid is one that completely dissociates into its ions in solution, which means it can release all its available hydrogen ions into the solution. Examples of strong acids include hydrochloric acid (HCl), sulfuric acid (H_2SO_4), and nitric acid (HNO_3). These acids are highly reactive and can conduct electricity well due to the high concentration of free ions.On the other hand, a weak acid only partially dissociates in solution, meaning only a fraction of the acid molecules release their hydrogen ions. This results in a lower concentration of hydrogen ions compared to strong acids at the same concentration. Examples of weak acids include acetic acid (found in vinegar), citric acid (found in citrus fruits), and lactic acid (produced in sour milk). Weak acids are less reactive and are poor conductors of electricity due to the lower availability of free ions.

2. The difference between dilute and concentrated acids lies in the proportion of acid to solvent (typically water) in a solution. A dilute acid has a relatively low ratio of acid to water, meaning there is a smaller amount of acid molecules in a larger volume of water. This affects the chemical's reactivity and the pH of the solution, making it less corrosive and safer to handle under normal conditions.Conversely, a concentrated acid has a high ratio of acid to water, indicating a large amount of acid molecules in a smaller volume of water. This increases the solution's reactivity, acidity, and corrosiveness, making it more hazardous to handle. Concentrated acids are more effective in chemical synthesis and industrial processes but require careful handling to avoid injuries or damage.

3. Indicators are chemicals that change color when added to acidic or basic solutions, making them crucial tools in chemistry for determining the pH of a substance. They are particularly important in titrations, where they help in identifying the completion of a reaction by changing color at a specific pH value.Natural indicators include:

   Litmus: Extracted from lichens, it turns red in acidic solutions and blue in basic solutions.

   Red cabbage juice: Changes color across a spectrum from red in acidic conditions to greenish-yellow in basic conditions due to the presence of anthocyanins.

   Synthetic indicators include:

   Phenolphthalein: It is colorless in acidic solutions and turns pink in basic solutions, typically used in titrations.

   Methyl orange: Changes from red in acidic conditions to yellow in basic conditions, suitable for detecting changes around pH 3.1 to 4.4.

4. Factory waste often contains chemical residues that can be highly acidic or basic. Neutralizing this waste before disposal is crucial to prevent environmental contamination, which can harm aquatic life, degrade soil quality, and pollute water sources. Neutralization involves adjusting the pH of the waste to make it safe for disposal.This is typically achieved by adding a substance that will counteract the waste's acidity or alkalinity. For acidic waste, bases like lime (calcium hydroxide) or sodium hydroxide are added to raise the pH towards neutral. For alkaline waste, acids like sulfuric acid or hydrochloric acid are used to lower the pH. The goal is to achieve a neutral or near-neutral pH, making the waste harmless to the environment when disposed of. This process not only helps in complying with environmental regulations but also aids in the responsible management of industrial by-products.

Chapter 5: Physical and Chemical Changes

A. 1. (c) 2. (d) 3. (c) 4. (a) 5. (b)

B. 1. Physical 2. Chemical 3. rusting 4. iron 5. solid

C. 1. Galvanization 2. Saturated 3. Evaporation 4. galvanization 5. Electrochemical corrosion

D. 1. A physical change affects only the physical properties of a substance, like shape or state, and is generally reversible. A chemical change results in the formation of one or more new substances with new chemical and physical properties, and it is often irreversible.

2. The two essential requirements for rusting are the presence of oxygen and moisture (water). Both must be available for iron to rust.
3. Iron gates are painted primarily to protect them from rusting. The paint acts as a barrier that prevents moisture and oxygen from reaching the iron surface, thereby slowing down or preventing the oxidation process that leads to rust.
4. When carbon dioxide gas is bubbled into lime water (a solution of calcium hydroxide), it reacts to form calcium carbonate, which is insoluble in water and forms a white precipitate, thus turning the lime water milky. The equation for the reaction is:

   $CO_2 + Ca(OH)_2 \rightarrow CaCO_3 + H_2O$

   Here, $CaCO_3$ is calcium carbonate, which appears as a white precipitate.
5. Crystallisation is a process used to separate a pure solid in the form of its crystals from a solution. It is used to purify solids; for example, the crystallisation of sugar from a sugar solution involves evaporating the water and allowing the sugar to form crystal structures, which are purer than the original dissolved solids.

E. 1. A chemical change involves the transformation of one or more substances into new substances with different properties. The characteristics of a chemical change include:

Formation of new substances: New chemical substances are produced, which have properties different from the reactants.

Energy changes: Chemical changes can involve the absorption or release of energy, often observable as heat, light, or sound.

Irreversibility: Many chemical changes are irreversible, meaning they cannot easily revert to the original substances without further chemical reactions.

Color change: A chemical change might involve a color change in the substances involved.

Gas production: The formation of gas bubbles is a common indicator of a chemical reaction, often seen as fizzing or bubbling.

Precipitate formation: The appearance of a solid from a solution in which it was previously dissolved is another sign of a chemical change.

2. When baking soda (sodium bicarbonate, $NaHCO_3$) is mixed with vinegar (acetic acid, CH_3COOH), the type of change that occurs is a chemical change. This reaction produces carbon dioxide gas, which is observed as bubbles. The chemical reaction involved is:

$$NaHCO3 + CH_3\,COOH \rightarrow CO_2 + H_2O + CH_3\,COONa$$

Here, sodium acetate (CH_3COONa), water (H_2O), and carbon dioxide gas (CO_2) are produced. The formation of gas (CO_2 bubbles) is a characteristic of a chemical change, confirming that a new substance has been formed.

3. Rusting of iron is a chemical change where iron reacts with oxygen and moisture (water) to form iron(III) oxide, commonly known as rust. The equation for the rusting of iron is:

$$4Fe + 3O_2 + 6H_2O \rightarrow 4Fe(OH)_3$$

which then dehydrates to form iron(III) oxide (Fe_2O_3). Two ways to prevent rusting are:

Galvanization: Coating iron with a layer of zinc protects the iron by acting as a barrier to water and oxygen. Zinc also acts as a sacrificial anode if the coating is scratched.

Painting or Coating: Applying a layer of paint or a plastic coating can seal off the iron from the environment, preventing the contact necessary for rusting.

4. Cutting a potato is a physical change as it involves changing the shape and size of the potato without altering its chemical composition. The internal structure of the potato remains the same at the molecular level. In contrast, frying a potato is a chemical change. It involves the reaction of the potato's carbohydrates and proteins with the hot oil and air, producing new substances like acrylamide and changing the chemical and physical properties of the potato, such as texture, flavor, and color.
5. When an iron nail is added to an acidified solution of copper sulphate ($CuSO_4$), a displacement reaction occurs. Iron being more reactive than copper, displaces copper from the copper sulphate solution. The iron dissolves into the solution forming iron sulphate ($FeSO_4$), and copper precipitates out of the solution. The reaction can be represented by the equation:

$$Fe + CuSO_4 \rightarrow FeSO_4 + Cu$$

Here, you will observe the iron nail gradually gets coated with red-brown copper metal, and the blue color of the copper sulphate solution fades as it is replaced by greenish iron sulphate. This experiment is a classic example of a single displacement reaction in chemistry.

Chapter 6: Respiration in Organisms

A.	1. (a)	2. (c)	3. (c)	4. (c)	5. (b)
B.	1. F	2. T	3. T	4. F	5. F
C.	1. (e)	2. (d)	3. (b)	4. (c)	5. (a)

D.
1. Aerobic respiration occurs in the presence of oxygen and produces more energy, typically in the form of carbon dioxide and water, whereas anaerobic respiration occurs without oxygen and generally produces less energy, resulting in products like alcohol or lactic acid.
2. The end products of aerobic respiration are carbon dioxide and water, and energy. For anaerobic respiration, it could be lactic acid or alcohol and carbon dioxide, depending on the organism.
3. The breathing rate increases to meet the higher oxygen demands of the body and to increase the elimination of carbon dioxide produced by the enhanced metabolic activity.
4. The main organs include the nose, trachea, bronchi, and lungs.
5. Earthworms breathe through their skin, which must remain moist to allow the diffusion of oxygen and carbon dioxide.

E.
1. Sneeze is a defensive response triggered when irritants like dust enter the nasal passages. The sensory nerves in the nasal cavity detect these irritants, and to expel them from the body and clear the nasal passages, the brain triggers a sudden, forceful expulsion of air from the lungs through the nose and mouth, which we recognize as a sneeze. This reflex is part of the body's immune defense, helping to prevent potentially harmful particles from entering the respiratory system.
2. Athletes often suffer from cramps due to a combination of factors including muscle fatigue, dehydration, or electrolyte imbalances. During intense physical activity, muscles may become overused, leading to the accumulation of lactic acid and other metabolites, which can cause muscle irritation and painful spasms or cramps. Additionally, sweating leads to loss of fluids and minerals like sodium and potassium, which are crucial for muscle function and hydration, further contributing to the likelihood of cramping.
3. Living things need energy to perform all bodily functions that sustain life, including growth, repair, and maintaining cellular processes. This energy comes from the breakdown of food in a process called metabolism. In autotrophs, like plants, energy is derived from sunlight through photosynthesis, converting light energy into chemical energy stored in glucose. Heterotrophs, such as animals and humans, obtain energy by consuming plants or other organisms, metabolizing carbohydrates, fats, and proteins from their food into usable energy.

4. Inhalation is the process of taking air into the lungs. It involves the diaphragm contracting and moving downwards, expanding the chest cavity and reducing the pressure inside the lungs, drawing air in. The external intercostal muscles also aid by elevating the ribs and expanding the chest volume.

   Exhalation is the process of expelling air from the lungs. It is generally a passive process where the diaphragm relaxes and moves upwards, and the chest cavity volume decreases, increasing the pressure in the lungs and forcing air out. The internal intercostal muscles can also contract to reduce the volume of the chest cavity more forcefully during vigorous breathing.

   Breathing rate, or respiratory rate, is the number of breaths taken per minute. This rate can vary depending on factors like age, activity level, and overall health, typically ranging from 12 to 20 breaths per minute in a resting adult.

5. The human respiratory system is composed of organs and structures responsible for gas exchange, primarily oxygen intake and carbon dioxide expulsion:

   Nasal cavity: Air enters through the nose, where it is filtered, warmed, and humidified.

   Pharynx: A passageway that directs air from the nasal cavity to the larynx and food from the mouth to the esophagus.

   Larynx: Contains the vocal cords and routes air into the trachea while blocking food and drink from entering the airway.

   Trachea: A tube that connects the larynx to the bronchi, lined with cilia that trap debris and microorganisms.

   Bronchi: The trachea divides into two bronchi, each entering one lung, where they further branch into smaller bronchioles.

   Bronchioles: Smaller branches of the bronchi that distribute air throughout the lungs.

   Alveoli: Tiny sac-like structures at the end of bronchioles where gas exchange occurs. Oxygen from inhaled air passes into the blood, and carbon dioxide from the blood is expelled into the alveoli to be exhaled.

   Diaphragm: A muscle that plays a crucial role in breathing by contracting and relaxing to change the pressure within the thorax, facilitating inhalation and exhalation.

   This diagram and description provide a simplified overview of how air travels through the respiratory system and how oxygen and carbon dioxide are exchanged in the lungs.

Chapter 7: Transportation in Animals and Plants

A.	1. (b)	2. (a)	3. (a)	4. (b)	5. (d)
B.	1. F	2. F	3. T	4. F	5. F
C.	1. d.	2. b.	3. c.	4. f.	5. e.
	6. a.				

D.
1. Blood consists of plasma, red blood cells (RBCs), white blood cells (WBCs), and platelets.
2. Veins contain valves that prevent the backflow of blood, ensuring it moves only towards the heart.
3. Blood is essential for transporting oxygen, nutrients, and waste products to and from cells throughout the body.
4. Excretion is the process of removing waste products from the body.
5. Transportation in biological systems is crucial for distributing essential nutrients and oxygen to cells and removing waste products, thereby maintaining the overall homeostasis of the organism.

E. 1. Blood is a specialized bodily fluid that supplies essential substances and nutrients to our cells and carries waste products away from those cells. It has four main components:

Plasma: This is the liquid portion of blood, making up about 55% of its volume. Plasma is mostly water (90%) but also contains proteins, glucose, mineral ions, hormones, and carbon dioxide.

Red Blood Cells (Erythrocytes): These are the most abundant cells in blood and are primarily responsible for carrying oxygen from the lungs to the body's tissues and bringing carbon dioxide back to the lungs to be exhaled.

White Blood Cells (Leukocytes): These cells are part of the immune system and are involved in protecting the body against both infectious disease and foreign invaders.

Platelets (Thrombocytes): These are tiny blood cells that help the body form clots to stop bleeding. If one of your blood vessels gets damaged, it sends out signals that are picked up by platelets. The platelets then rush to the site of damage and form a plug, or clot, to repair the damage.

2. The three major types of blood vessels are arteries, veins, and capillaries.

Arteries: These vessels carry oxygen-rich blood away from the heart to all of the body's tissues. They have thick, elastic walls to withstand the high pressure of blood pumped by the heart.

Veins: These carry oxygen-poor blood back to the heart. Veins have thinner walls than arteries and larger lumen (interior space). They rely on muscle contractions to help push blood back to the heart and have valves that prevent backflow.

Capillaries: These are the smallest blood vessels and connect arteries to veins. Capillaries have walls that are only one cell thick, which allows nutrients and oxygen to diffuse from the blood into tissues, and waste materials to move into the blood.

3. The heart is a muscular organ that serves as a pump to circulate blood throughout the body. It performs several critical functions:

Pumping oxygenated blood to the body and deoxygenated blood to the lungs: The left side of the heart receives oxygen-rich blood from the lungs and pumps it to the body, while the right side receives oxygen-poor blood from the body and pumps it back to the lungs.

Maintaining blood pressure: By continuously pumping blood, the heart ensures that a sufficient pressure gradient is maintained in the blood vessels that facilitates the flow of blood throughout the body.

Regulating blood supply: Based on the body's needs, the heart adjusts the rate and strength of its contractions.

4. Transpiration is the process by which moisture is carried through plants from roots to small pores on the underside of leaves, where it changes to vapor and is released to the atmosphere. Transpiration is crucial because it helps regulate the temperature of the plant, aids in nutrient uptake and transport in the xylem, and contributes to the water cycle by returning water vapor to the environment.

5. Transportation in plants occurs through three major components:

Xylem: This tissue transports water and soluble mineral nutrients from the roots throughout the plant. It is typically a one-way flow from roots to the stems and leaves.

Phloem: This tissue transports organic compounds, particularly sucrose, a disaccharide formed during photosynthesis, from the leaves to the rest of the plant. This process is known as translocation and it can move in both directions to supply all parts of the plant with food and other necessities.

Root system: Roots absorb water and mineral nutrients from the soil, which are then transported up to the rest of the plant via the xylem. The extensive network of root hairs increases the surface area for absorption.

Chapter 8: Reproduction in Plants

A.	1. (b)	2. (c)	3. (a)	4. (c)	5. (c)
B.	1. F	2. T	3. F	4. T	5. T
C.	1. parent	2. Fragmentation	3. filament	4. reproduce	5. two

D. 1. Wind, water, animals, and explosion are agents of seed dispersal.

2. Fertilisation occurs after pollen grains transfer from the anther to the stigma, leading to the union of male and female gametes to form a zygote.

3. Budding, fragmentation, spore formation, and vegetative propagation are methods of asexual reproduction.

4. Pollination, fertilisation, formation of seeds, and formation of fruit.

5. Sexual reproduction involves the fusion of male and female gametes, while asexual reproduction does not involve gametes and usually involves a single parent.

E. 1. Asexual reproduction offers several advantages:

Efficiency and Speed: It allows organisms to reproduce quickly and efficiently, which is particularly beneficial in stable, unchanging environments where adaptation to new conditions is not necessary.

No need for mates: It eliminates the need for a sexual partner, which can be advantageous in environments where mates are scarce.

Energy Conservation: It conserves energy that would otherwise be spent on finding a mate and the process of sexual reproduction.

Predictable Outcomes: It produces genetically identical offspring, ensuring that the successful traits of the parents are preserved and passed on directly without the genetic variability introduced by sexual reproduction.

2. Bread mould, typically from the genus Rhizopus, reproduces primarily asexually through the production of spores. The life cycle includes the development of sporangia, which are structures that form at the tips of the hyphae (the mold's filamentous growth). Inside these sporangia, numerous spores are produced. Once mature, the sporangia release the spores into the air, where they can settle on new substrates and germinate, growing into new mold colonies if conditions are moist and nutrient-rich. Bread mould can also reproduce sexually under certain conditions, which involves the fusion of hyphae from different strains to form a new genetic combination.

3. Seed dispersal is crucial for several reasons:

Reducing Competition: It allows seeds to spread to new locations away from the parent plant, reducing competition for light, space, and nutrients.

Expanding Territories: Dispersal mechanisms help plants colonize new geographical areas, enhancing their ability to adapt to different environments.

Avoiding Predators and Disease: Spreading out can help minimize the risks of predator pressure and disease transmission that might decimate localized populations of plants.

Seeds are dispersed by various agents:

Wind: Lightweight seeds or those with wings or fluffy appendages, like dandelions and maple trees, are carried away by the wind.

Water: Seeds that are buoyant, such as coconuts and mangrove seeds, can travel long distances across water.

Animals: Seeds can adhere to the fur of animals using hooks or barbs, like burdock, or be ingested by animals and later excreted in different locations, as with many fruit-bearing plants.

Mechanical: Some plants, like the touch-me-not (Mimosa pudica), have seed pods that burst open when ripe, flinging seeds away from the parent plant.

4. Draw diagram yourself.

   The typical flower is structured with both male and female reproductive parts:

   Male Reproductive Part (Stamen): Consists of the anther and filament. The anther produces pollen grains which are the male gametes.

   Female Reproductive Part (Pistil or Carpel): Composed of the stigma, style, and ovary. The ovary contains ovules, and after fertilization, these develop into seeds. The style is a stalk that supports the stigma, which receives the pollen during fertilization.

5. **Umbra and Penumbra:** A shadow consists of two parts; the darker part where all the light is blocked is called the umbra, and the lighter, partial shadow is the penumbra.

   Color: Shadows are inherently colorless or black, as they are formed due to the absence of light.

   Size and Shape: The size and shape of a shadow can change depending on the light source's distance and angle relative to the object creating the shadow.

   Edges: The edges of a shadow may be sharp or blurred, depending on the light source's size and distance. A point light source creates a sharp-edged shadow, while an extended light source creates a shadow with a more blurred edge.

Chapter 9: Motion and Time

A.	1. (b)	2. (c)	3. (d)	4. (b)	5. (b)
B.	1. F	2. F	3. T	4. F	5. T
C.	1. c.	2. a.	3. b.	4. d.	

D.
1. Average speed is defined as the total distance traveled divided by the total time taken to travel that distance.
2. Periodic motion is motion that repeats at regular time intervals, such as the swinging of a pendulum.
3. A simple pendulum typically consists of a string or wire with a weight (bob) attached to one end and fixed at the other end.
4. Speed = Distance / Time = 150 km / 5 hrs = 30 km/hr.
5. Oscillation refers to the movement of a pendulum from its mean position to one extreme, back through the mean to the other extreme, and then back to its initial position. The time period of a pendulum is the time it takes to complete one full oscillation.

E.
1. Uniform Motion: Occurs when an object moves at a constant speed along a straight path. The distance covered by the object in equal intervals of time remains consistent. For example, a car traveling at a steady speed of 60 km/hr on a highway.

   Non-uniform Motion: Occurs when an object's speed changes over time, covering different distances in equal time intervals. This can happen due to acceleration or deceleration. For example, a bus that makes stops at various stations will experience non-uniform motion as it speeds up and slows down.
2. The speed of an object from a distance-time graph can be determined by calculating the slope of the line on the graph. The steeper the slope, the faster the speed. The slope can be calculated by selecting two points on the line and dividing the change in distance (vertical difference) by the change in time (horizontal difference). This gives the average speed between those two points.
3. draw diagram yourself.

A simple pendulum consists of a weight (called a bob) attached to the end of a lightweight cord or rod that is fixed at a pivot point. When the bob is lifted and released, it swings back and forth under the influence of gravity and its own inertia. Here's a basic labelled diagram of a simple pendulum:

Pivot: The fixed point from which the pendulum hangs.

String/Rod: A lightweight line that holds the bob and allows it to swing.

Bob: A weight at the bottom of the pendulum.

4. Distance-Time Graph: Shows how distance varies with time. A straight diagonal line indicates uniform motion, while a curved line indicates acceleration or deceleration.

   Speed-Time (or Velocity-Time) Graph: Illustrates how speed changes over time. A horizontal line indicates constant speed, while a slope indicates acceleration.

   Acceleration-Time Graph: Displays how acceleration varies over time. A constant line above the time-axis shows constant acceleration, and a line at zero indicates no acceleration.These graphs provide visual representations of motion and can be used to analyze the behavior of moving objects.

5. First, convert the time from minutes to hours: 30 minutes = 0.5 hours.

   Use the formula: Distance = Speed × Time.

   Calculation: Distance = 20 km/hr × 0.5 hours = 10 km.

   Thus, the distance between your father's house and office is 10 kilometers.

Chapter 10: Electric Current and Its Effects

A.	1. (c)	2. (a)	3. (d)	4. (b)	5. (a)
B.	1. T	2. F	3. F	4. T	5. T
C.	1. electric	2. strip	3. filament	4. single	5. current

D. 1. A bulb, a switch in the off position, an electric fuse, and a battery consisting of four cells. Details of these symbols can be found within the educational material.

2. The essential components include a power source (like a battery or cell), conductors (wires), a load (like a bulb), and a switch to control the flow of electricity.

3. Do it yourself.

4. Magnetic effect and heating effect.

5. A fuse is a safety device in an electric circuit that prevents damage to appliances by melting and breaking the circuit when excessive current flows through it.

E. 1. An electric bell operates using both an electromagnet and a switch mechanism. When the switch is closed, electric current flows through a circuit and energizes an electromagnet. The magnetic field produced by the electromagnet attracts a metal arm with a hammer at one end towards it, causing the hammer to strike the bell and produce a sound. After striking, the arm moves away from the electromagnet, breaking the circuit momentarily. This de-energizes the electromagnet, causing the arm to return to its original position, restoring the circuit connection and repeating the process as long as the switch remains closed. This rapid repeating action produces the continuous ringing sound of the electric bell.

2. The heating effect of electric current refers to the phenomenon where electrical energy is converted into heat energy when electric current flows through a conductor. This effect is used in various domestic and industrial appliances where heat is required. Five appliances based on the heating effect of electric current are:

Electric kettle: Heats water by passing current through a heating element.

Electric toaster: Browns bread by heating it with electric coils.

Electric iron: Smooths clothes using a heated metal plate.

Electric oven: Cooks food by heating the air inside the oven through electric coils.

Immersion heater: Heats water by submerging a resistant heating element directly into the liquid.

3. To make an electromagnet in the laboratory, you will need a soft iron core (like a nail or a bolt), insulated copper wire, and a power source (such as a battery). Here are the steps:

   Wrap the copper wire tightly and evenly around the iron core, leaving enough wire free at both ends to connect to the battery.

   Strip the insulation off the ends of the wire.

   Attach the ends of the wire to the terminals of the battery, ensuring a good contact.

   Once the circuit is complete, the iron core becomes magnetized and can attract ferromagnetic materials like iron filings or small metal objects.

   Disconnect the battery to demagnetize the core when done.

4. An electromagnet is a type of magnet whose magnetic field is produced by the flow of electric current. The magnetic field disappears when the current is turned off. Electromagnets are widely used in various applications due to their controllable strength and magnetic properties. Some uses include:

   In electric bells: To drive the hammer that strikes the bell.

   In motors and generators: To convert electricity into mechanical movement or vice versa.

   In maglev trains: To lift and propel the train using strong magnetic fields.

   In cranes: To lift and move heavy magnetic objects in scrap yards or docks.

   The strength of an electromagnet depends primarily on two factors:

   The number of coils: More coils around the iron core result in a stronger magnetic field.

   The current passing through the coil: A higher current increases the magnetic field strength. However, care must be taken to avoid overheating the wire.

Chapter 11: Light

A.	1. (d)	2. (c)	3. (a)	4. (b)	5. (a)
B.	1. T	2. T	3. T	4. F	5. F
C.	1. d.	2. b.	3. c.	4. a.	5. e.

D. 1. A plain mirror produces a virtual image.

2. Lateral inversion is a phenomenon where left appears as right and right as left when viewed in a mirror.

3. A real image can be obtained on a screen, while a virtual image cannot be obtained on a screen.

4. Concave mirrors: Used in headlights of cars and by dentists to see enlarged images of teeth.

   Convex mirrors: Used as rear view mirrors in vehicles and in shops/malls for surveillance.

5. A concave lens is thinner in the middle and thicker at the edges, producing virtual, erect, and diminished images; a convex lens is thicker in the middle, thinner at the edges, and forms real, inverted images unless the object is very close.

E. 1. Concave Mirror: A concave mirror curves inward like a cave. It converges light rays to a focal point in front of the mirror when the light sources are placed at a distance greater than the focal length. This type of mirror can create both real and virtual images depending on the position of the object relative to the focal point.

Convex Mirror: A convex mirror bulges outward. It diverges light rays, meaning that the rays spread out after reflecting off the surface. It always forms virtual, diminished, and upright images regardless of the object's position. This type of mirror has a wider field of view and is commonly used in vehicle rearview mirrors.

Plain Mirror: A plain mirror has a flat reflective surface. It produces images that are virtual, upright, and the same size as the object. The image formed is laterally inverted, meaning that the left side of the object appears on the right side of the image, and vice versa.

2. The word "AMBULANCE" is often written in reverse (as "ECNALUBMA") on the front of the vehicle so that when drivers see the ambulance in their rear-view mirrors, the word appears the correct way round. This immediate recognition is crucial for emergency vehicles, as it allows other drivers to quickly identify an ambulance behind them and give way appropriately.
3. Both a convex lens and a concave mirror can converge light rays to a focal point. This property allows them to produce real images when the object is placed outside the focal length. In terms of image formation, both can produce magnified images of objects placed at specific distances. This converging ability makes them useful in applications such as imaging, focusing light, and in optical instruments like telescopes and cameras.
4. Draw Diagram Yourself.

   Dispersion of white light refers to the process by which white light is split into its constituent colors (spectrum) when it passes through a medium like a glass prism. The different colors of light have different wavelengths and thus bend by different amounts when passing through the prism. Violet light bends the most, while red light bends the least. This separation of colors is what we see as the spectrum.
5. Activity to demonstrate light convergence with a convex lens:

   Hold a convex lens at arm's length in front of a piece of paper.

   Aim the lens towards sunlight or a bright light source.

   Move the lens back and forth until you find a point where a bright spot of light forms on the paper. This spot is the focal point where light rays converge.

   Activity to demonstrate that a concave lens does not converge rays:

   Replace the convex lens with a concave lens and repeat the experiment.

   You will notice that no matter how you move the lens, you cannot form a concentrated spot on the paper. Instead, the light rays diverge, spreading out wider as they pass through the lens.

Chapter 12: Forests: Our lifeline

A.	1. (c)	2. (a)	3. (c)	4. (c)	5. (d)
B.	1. F	2. F	3. F	4. F	5. T
C.	1. a.	2. b.	3. d.	4. b.	5. e.

D. 1. The three layers of a forest are the emergent layer, the canopy, and the understorey.

2. Forests prevent floods by absorbing rainwater with their root systems, which reduces runoff and soil erosion, and allows water to percolate into the ground, recharging groundwater supplies.
3. Timber, firewood, fiber, paper, and medicinal plants.

4. Decomposers, such as bacteria and fungi, break down dead plant and animal matter into simpler substances, returning nutrients to the soil and supporting new plant growth.
5. Understoreys are the layers in a forest located below the canopy, typically consisting of smaller trees, shrubs, and plants.

E. 1. **Biodiversity:** Forests are home to more than 80% of the terrestrial species of animals, plants, and insects. This biodiversity is crucial for ecosystem stability, medicinal research, and agricultural diversity.

Climate Regulation: Forests help regulate the Earth's climate by absorbing carbon dioxide during photosynthesis, thereby reducing the impact of climate change.

Water Regulation: They play a key role in the water cycle, absorbing rainfall and releasing water vapor into the atmosphere, which helps maintain the global and regional climate.

Soil Conservation: The root systems of forest trees help bind the soil, preventing erosion, and the decomposition of forest litter adds nutrients to the soil, maintaining its fertility.

Resources: Forests provide a variety of resources including timber, resin, rubber, and other non-timber forest products that are economically valuable.

2. Deforestation is the clearing or thinning of forests by humans. Deforestation is primarily done to make land available for agriculture, urban development, or timber extraction.

Consequences of Deforestation:

Loss of Biodiversity: Removing trees destroys habitats and leads to the loss of wildlife. Many species risk extinction due to habitat loss.

Climate Change: Forests act as carbon sinks; removing them increases the amount of CO2 in the atmosphere, contributing to global warming.

Soil Erosion: Without tree roots to anchor the soil, deforestation leads to increased erosion, which can result in the loss of fertile land and increased sedimentation in rivers and streams.

Disruption of the Water Cycle: Trees release water vapor into the air, influencing local and global precipitation. Without forests, the amount and pattern of rainfall can change dramatically.

Impact on Indigenous Communities: Many indigenous tribes rely on forests for their livelihood. Deforestation displaces these communities and destroys their cultures and traditions.

3. A food chain illustrates the feeding relationships between species within an ecosystem, showing how energy is transferred from one organism to another. For example, in a forest ecosystem:

Grass (Producer) absorbs sunlight and uses photosynthesis to make nutrients.

Deer (Primary Consumer) eats the grass.

Tiger (Secondary Consumer) eats the deer.

Bacteria and Fungi (Decomposers) break down dead organic matter from the tiger, returning nutrients to the soil.

This simple chain shows how energy is passed and transformed in an ecosystem from producers to consumers and finally to decomposers.

4. Forests play a crucial role in the carbon cycle. Through the process of photosynthesis, trees and other plants absorb CO_2 from the atmosphere and release oxygen. This not only removes harmful greenhouse gases but also provides the essential oxygen that all aerobic organisms need to survive. By storing carbon in their biomass and soil, forests significantly mitigate the impact of human-generated CO_2 emissions.
5. **Legal Protection:** Implementing strict laws to protect remaining forested areas from logging or conversion to agricultural land.

Sustainable Practices: Promoting sustainable forest management practices that allow for the use of forest resources without leading to degradation.

Reforestation and Afforestation: Planting more trees to restore deforested areas and to expand the coverage of forest land.

Educating Communities: Educating people about the importance of forests and how they can contribute to their conservation.

Supporting Conservation Initiatives: Supporting or getting involved in various conservation programs and initiatives that aim to protect and restore forests.

Chapter 13: Wastewater Story

A.	1. (b)	2. (c)	3. (a)	4. (d)	5. (a)
B.	1. F	2. T	3. T	4. F	5. F
C.	1. Seawater	2. Groundwater	3. Potable	4. Wastewater	5. Biogas

D. 1. Sewage is wastewater that flows through sewers and drains, including water from household, industrial, and other human activities.

2. Oils and fats should not be released into the drains as they can clog the pipes, reducing the effectiveness of filtering water.

3. Wastewater contains organic and inorganic impurities, nutrients, bacteria, and microbes that can cause diseases.

4. When sewage is passed through bar screens, large objects like rags, sticks, cans, and other debris are removed.

5. Digestion refers to the biological process where the organic matter in sludge is broken down by anaerobic bacteria, producing methane, carbon dioxide, and humus, and biogas can also be produced during this process.

E. 1. Discharging untreated sewage into rivers and seas is harmful for several reasons:

Pollution and Disease: Untreated sewage contains harmful bacteria and viruses that can cause waterborne diseases such as cholera, typhoid, and hepatitis, posing serious health risks to humans and animals.

Eutrophication: Sewage is rich in nutrients like nitrogen and phosphorus, which can lead to excessive growth of algae (algal blooms) in water bodies. This process, known as eutrophication, depletes oxygen in the water, killing aquatic life and disrupting ecosystems.

Disruption of Aquatic Life: Toxic substances in sewage, including heavy metals and chemical contaminants, can poison aquatic flora and fauna, leading to diminished biodiversity and the disruption of food chains.

Economic Impact: Pollution from untreated sewage can affect industries such as fishing and tourism, leading to economic losses and affecting livelihoods dependent on clean water sources.

2. To maintain sanitation in public places, we should avoid:

Littering: Throwing garbage, especially non-biodegradable waste, in public areas can lead to unsanitary conditions and environmental pollution.

Spitting: Spitting in public places can spread infectious diseases and contribute to unhygienic conditions.

Open Defecation and Urination: These practices not only contribute to unsanitary conditions but also pose serious health risks to the public.

Overuse of Chemical Cleaners: Excessive use of harsh chemical cleaners in public restrooms can pollute water sources and harm wildlife.

3. **Treatment of Wastewater:** Before discharging into water bodies, treat wastewater using physical, chemical, and biological processes to remove contaminants.

   Proper Waste Disposal: Ensure proper disposal and management of industrial and household waste to prevent it from entering waterways.

   Regulations and Monitoring: Implement strict environmental regulations and regular monitoring of water quality to prevent illegal dumping and ensure compliance with pollution standards.

   Public Awareness and Education: Educate the public about the importance of water conservation and the impacts of water pollution to encourage environmentally responsible behaviors.

4. Improper drainage can lead to several harmful effects:

   Waterlogging: Poor drainage can cause waterlogging, which damages infrastructure, makes areas unsuitable for habitation, and can lead to the breeding of mosquitoes and other pests.

   Soil Erosion: Inadequate drainage can lead to soil erosion, removing the top fertile layer of soil and reducing land productivity.

   Spread of Disease: Stagnant water from poor drainage can become a breeding ground for pathogens and pests that spread diseases such as malaria and dengue fever.

   Pollution: Improper drainage often leads to the mixing of sewage with stormwater, leading to the pollution of rivers, lakes, and groundwater.

5. A septic tank is an underground chamber made of concrete, fiberglass, or plastic, used for basic treatment of domestic sewage. Its functioning involves several steps:

   Settling and Separation: Wastewater from the home flows into the septic tank where solids settle at the bottom forming sludge, while oils and grease float to the top as scum.

   Digestion: Anaerobic bacteria in the tank digest the organic matter in the sludge, reducing its volume and making it less hazardous.

   Effluent Discharge: The relatively clear water layer in the middle (effluent) flows out of the tank into a drainage field where it is further treated through percolation into the soil, which acts as a natural filter, removing harmful bacteria and nutrients.

   Maintenance: Regular pumping is necessary to remove the accumulated sludge and prevent the system from overflowing or malfunctioning.

E. Do it Yourself.

Revision Test Paper-1

A. 1. (b) 2. (b) 3. (b) 4. (a) 5. (a)

B. 1. T 2. T 3. F 4. T 5. T

C. 1. Chloroplasts

2. Mouth, esophagus, stomach, small intestine, large intestine, rectum, anus

3. Unwinding 4. Conduction 5. Dark surface

Revision Test Paper-2

A. 1. (b) 2. (c) 3. (c) 4. (a) 5. (b)

B. 1. T 2. T 3. T 4. F 5. F

C. 1. Malic acid 2. Hibiscus 3. Galvanization 4. Instrument 5. Wind speed

Model Test Paper-1

A. 1. Algae primarily engage in photosynthesis, making them autotrophs. They utilize sunlight to convert carbon dioxide and water into nutrients, releasing oxygen as a byproduct.

2. Assimilation in biological terms refers to the process by which living cells convert nutrients from food into the cellular structures necessary for life. This involves the absorption and digestion of food substances to produce energy or build new tissues.

3. Shearing involves cutting the wool from sheep, which is not painful as wool is made from hair, and like human haircuts, the process does not involve harming the skin or nerve endings.

4. Jerking a clinical thermometer before use ensures that the mercury level falls below the normal body temperature mark, ensuring that it accurately measures the body temperature from a lower starting point without residual readings from previous uses.

5. Acids are substances that produce hydrogen ions ($H+$) when dissolved in water and have a sour taste, while bases produce hydroxide ions ($OH-$) in water and typically have a bitter taste and slippery feel. Acids turn blue litmus paper red, whereas bases turn red litmus paper blue.

B. 1. Plants 2. mechanical 3. mulberry leaves 4. woolen 5. blue and red

C. 1. c. 2. e. 3. a. 4. b. 5. d.

D. 1. Land and sea breezes are atmospheric phenomena produced by temperature differences between the land and the ocean. During the day, the land heats up more quickly than the sea. The warm air over the land expands and rises, creating a low-pressure area. The cooler, denser air over the sea, being at a higher pressure, moves toward the land to replace the rising warm air. This movement of air from the sea to the land is known as a sea breeze. At night, the process reverses: the land cools faster than the sea. The air over the sea is now warmer and rises, causing a low pressure, and the cooler air from the land moves towards the sea to replace it, creating a land breeze. These breezes are cyclic and depend on the differential heating and cooling of the land and sea.

2. Factory waste often contains chemicals that can be harmful to the environment and living organisms. Neutralizing this waste ensures that its disposal does not lead to pollution or damage to ecosystems. The neutralization process typically involves adjusting the pH of the waste to make it safe. If the waste is acidic, a base (like lime or sodium hydroxide) is added to raise the pH to a neutral level. Conversely, if the waste is basic, an acid (such as sulfuric acid or hydrochloric acid) is added to lower the pH. This treatment helps in minimizing the corrosive properties of the waste and prevents harmful reactions when the waste comes into contact with the environment or enters water bodies.

3. Rusting of iron is an oxidation reaction of iron and oxygen in the presence of water or air moisture. It results in the formation of iron oxides, which are reddish-brown, flaky substances that corrode the iron over time. To prevent rusting, two common methods are:

Galvanization: Coating the iron with a layer of another metal, typically zinc, which is more reactive to oxygen than iron. This protects the iron by sacrificially corroding instead of the iron.

Painting or Coating: Applying a layer of paint or a plastic coating to shield the iron from exposure to oxygen, water, and other corrosive agents. This barrier prevents the iron from coming into direct contact with elements that cause rust.

4. Once wool is sheared from sheep, it undergoes several processes before becoming usable fiber:

Scouring: The raw wool is washed in hot water to remove grease (lanolin), dirt, and other impurities.

Carding: The clean wool is then carded, a process where the fibers are disentangled, cleaned, and intermixed to produce a continuous web or sliver suitable for spinning.

Spinning: The carded wool fibers are spun into yarn, by twisting them to impart strength for weaving or knitting.

Dyeing: Often, the wool is dyed into various colors before or after spinning, depending on the desired product.

5. Ruminants like cows and goats have a complex stomach divided into four compartments: the rumen, reticulum, omasum, and abomasum.

   Rumen: The largest part where newly ingested feed is mixed with ruminal fluid to initiate microbial fermentation.

   Reticulum: Works with the rumen to mix the contents and regurgitate them as cud for the animal to chew and further break down.

   Omasum: Here, much of the water is absorbed, and the feed particles are further reduced.

   Abomasum: This is the true stomach where enzymatic digestion begins, similar to monogastric animals. The digested material then moves into the intestine where nutrients are absorbed.

Revision Test Paper-3

A. 1. (b) 2. (c) 3. (b) 4. (c) 5. (d)

B. 1. F 2. F 3. T 4. T 5. F

C. 1. Carbon dioxide 2. Ammonia 3. Insects, Wind, Water, Birds
4. Coconut, Walnut 5. Quartz clock

Revision Test Paper-4

A. 1. (b) 2. (d) 3. (a) 4. (d) 5. (b)

B. 1. F 2. F 3. F 4. F 5. T

C. 1. Lifting heavy metals, electric bells 2. Red, Orange, Yellow, Green, Blue, Indigo, Violet (ROYGBIV)
3. Lowers 4. Trees, wildlife 5. Garbage

Model Test Paper-2

A. 1. The end products of aerobic respiration are carbon dioxide, water, and energy (in the form of ATP). Anaerobic respiration may produce lactate or ethanol and carbon dioxide, depending on the organism.

2. Blood consists of plasma (the liquid component), red blood cells (erythrocytes), white blood cells (leukocytes), and platelets (thrombocytes).

3. Agents of seed dispersal include animals, wind, water, and mechanical forces (such as explosion of fruits).

4. Average speed is calculated as the total distance traveled divided by the total time taken to travel that distance. It is a measure of the overall rate of movement over a journey.

5. A fuse is a safety device consisting of a strip of wire that melts and breaks an electric circuit if the current exceeds a safe level, thereby preventing damage or fire.

B. 1. Alcohol and carbon dioxide 2. The heart 3. The ovary

4. The second 5. A tissue

C. 1. F 2. F 3. F 4. T 5. F

D. 1. When we are in a highly dusty area, our bodies react by sneezing to expel the dust particles from our nasal passages. Sneezing is a protective reflex that helps clear irritants and pathogens from the nose, ensuring that these particles do not enter the lungs where they could cause respiratory issues or infections. The presence of dust triggers the mucous membranes to release histamine, which causes the sneezing reflex.

2. Athletes often suffer from muscle cramps due to several factors including dehydration, electrolyte imbalances, or muscle fatigue. During intense physical activity, the body loses fluids and electrolytes through sweat, which can disrupt the balance of minerals like potassium, calcium, and magnesium that are essential for muscle function and nerve conduction. Additionally, excessive use of muscles without adequate rest or stretching can lead to cramps as muscles become overused or strained. Proper hydration, balanced electrolyte intake, and adequate muscle conditioning can help prevent cramps.

3. Blood is a complex bodily fluid that plays vital roles in transporting oxygen and nutrients, removing waste, and immune responses. It consists of:

Plasma: This is the liquid portion of blood, making up about 55% of its volume. Plasma is primarily water (about 90%), but it also contains dissolved proteins, glucose, clotting factors, electrolytes, hormones, carbon dioxide, and oxygen.

Red Blood Cells (Erythrocytes): These cells carry oxygen from the lungs to the body's tissues and take carbon dioxide back to the lungs to be expelled. They contain hemoglobin, a protein that binds oxygen.

White Blood Cells (Leukocytes): These cells are part of the immune system and are involved in protecting the body against both infectious disease and foreign invaders.

Platelets (Thrombocytes): These are small cell fragments involved in clotting. They work with clotting factors in plasma to help stop bleeding by clumping and forming plugs in blood vessel injuries.

4. Fertilization in plants involves several key steps:

Pollination: The transfer of pollen from the male part of the flower (anther) to the female part (stigma). This can be achieved via wind, water, insects, or other animals.

Germination of Pollen: Once pollen lands on a compatible stigma, it germinates, forming a pollen tube that extends through the style to reach the ovary.

Sperm Delivery: The pollen tube delivers sperm cells to the ovule inside the ovary.

Fusion of Gametes: The sperm cells fuse with the egg cell within the ovule, resulting in the formation of a zygote.

Seed Development: The fertilized ovule develops into a seed, and the surrounding ovary develops into a fruit, which protects the seed and may aid in its dispersal.

5. The speed of an object can be determined from its distance-time graph by calculating the slope of the line that represents the object's movement over time. The slope of the line on a distance-time graph represents the speed, where:

Slope Calculation: Divide the change in distance (vertical axis) by the change in time (horizontal axis) between any two points on the graph.

Steepness and Speed: A steeper slope indicates a higher speed, showing that the object covers more distance in less time.

Flat Line: A flat line indicates that the object is stationary, as there is no change in distance over time.

Negative Slope: If the slope is negative (line going downwards), it indicates the object is returning towards the starting point.