CHAPTER – 1

NUTRITION IN PLANTS

- **Nutrition:** It is the mode of taking food by an organism and its utilization by the body.
- **Nutrients:** The components of food that provide nourishement to the body.
- All organisms take food and utilise it to get energy for the growth and maintenance of their bodies.
- Green plants synthesise their food themselves by the process of photosynthesis. They are **autotrophs**.
- **Photosynthesis**: Green plants prepare their own food with the help of carbon dioxide and water tekn from the environment in presence of sunlight called **chlorophyll (found in green plants)** for the manufacture of food. This process is known as photosynthesis.
- Plants use simple chemical substances like carbon dioxide, water and minerals for the synthesis of food.
- Chlorophyll and sunlight are the essential requirements for photosynthesis.
- Complex chemical substances such as carbohydrates are the products of photosynthesis.
- Solar energy is stored in the form of food in the leaves with the help of chlorophyll.
- Oxygen is produced during photosynthesis.
- Oxygen released in photosynthesis is utilised by living organisms for their survival.
- Fungi derive nutrition from dead, decaying matter. They are saprotrophs. Plants like Cuscuta are parasites. They take food from the host plant.
- A few plants and all animals are dependent on others for their nutrition and are called **heterotrophs**.
- **Parasitic**: Organisms that live on the body of other organisms.
- All parasitic plants feed on other plants as either:
  (i) **Partial Parasites:** Obtain some of their nutrition from the host, e.g. painted cup.
  (ii) **Total Parasites:** dependent completely on the host for nutrition, e.g. mistletoe.
- **Saprophytic:** Organisms that obtain nutrition from dead and decaying plant and animal matter.
- Mushrooms, moulds and certain types of fungi and bacteria.

- **Insectivorous Plants:** Green plants which obtain their nourishment partly from soil and atmosphere and partly from small insects. Example: pitcher plant, bladderwort, and venus fly trap.
- **Symbiosis:** Mode of nutrition in which two different individuals associate with each other to fulfil their requirement of food.
- Lichens found on tree trunks is the association between alga and fugus. Alga obtains water from fungus and it in turn obtains food from alga.

Chapter – 2

Nutrition in Animals

- **Classification based on Eating Habits:**
  (i) **Herbivorous:** animals that obtain their food only from plants. Example: cow, sheep, goat, deer, elephant, kangaroo, giraffe, etc.
  (ii) **Carnivorous:** Animals that obtain their food by killing other animals. They never eat plants. Example: tiger, lizard, lion, etc.
  (iii) **Omnivorous:** Animals consume plants as well as other animals as their food. Example: bear, dog, human being, etc.
  (iv) **Parasites:** Organisms that obtain their food from other animals either by living inside (endoparasites) or outside (ectoparasites) their body. Example: tapeworm and roundworm (inside body), tick and lice (outside body).
  (v) **Scavengers:** Animals which feed on the remains of dead animals preyed by predators. Example: vulture, crows, jackal, etc.
- Animal nutrition includes nutrient requirement, mode of intake of food and its utilisation in the body.
- The human digestive system consists of the alimentary canal and secretory glands. It consists of the
  (i) buccal cavity,
  (ii) oesophagus,
  (iii) stomach,
  (iv) small intestine,
  (v) large intestine ending in rectum
  (vi) anus.
- The main digestive glands which secrete digestive juices are
  (i) the salivary glands,
  (ii) the liver and
  (iii) the pancreas.
- The stomach wall and the wall of the small intestine also secrete digestive juices.
- The modes of feeding vary in different organisms.
- Nutrition is a complex process involving:

(i) ingestion,

(ii) digestion,

(iii) absorption,

(a) assimilation and

(b) egestion.

- Digestion of carbohydrates, like starch, begins in the buccal cavity. The digestion of protein starts in the stomach. The bile secreted from the liver, the pancreatic juice from the pancreas and the digestive juice from the intestinal wall complete the digestion of all components of food in the small intestine. The digested food is absorbed in the blood vessels from the small intestine.
- The absorbed substances are transported to different parts of the body. Water and some salts are absorbed from the undigested food in the large intestine.
- The undigested and unabsorbed residues are expelled out of the body as faeces through the anus.
- The grazing animals like cows, buffaloes and deer are known as ruminants. They quickly ingest, swallow their leafy food and store it in the rumen. Later, the food returns to the mouth and the animal chews it peacefully.
- **Amoeba** ingests its food with the help of its false feet or pseudopodia. The food is digested in the food vacuole. It pushes out finger-like pseudopodia which engulf the prey.

Chapter – 3
Fibre to Fabric

- **Fibres:** Long, fine, continuous threads or filaments are obtained from plants and animals. Two types of fibers: (i) **Animal fibres** (ii) **Plant fibres**
- Animal fibres are obtained from two sources: **Silk** and **Wool**
- **Silk** comes from silkworms and wool is obtained from sheep, goat and yak. Hence silk and wool are animal fibres.
- The hairs of camel, llama and alpaca are also processed to yield wool.
- In India, mostly sheep are reared for getting wool.
- Sheep hair is sheared off from the body, scoured, sorted, dried, dyed, spun and woven to yield wool.
- Silkworms are caterpillars of silk moth.
- During their life cycle, the worms spin cocoons of silk fibres.
- Silk fibres are made of a protein.
- Silk fibres from cocoons are separated out and reeled into silk threads.
- Weavers weave silk threads into silk cloth.
- **Wool: Sources of Wool:** Wool is obtained from sheep, yak (Tibet and Ladakh), Angora goat, goat, camels, llama and Alpaca (South America)
- **Obtaining wool fibre:** Shearing: Fleece of the sheep along with a thin layer of skin is removed from its body.
- **Processing of Wool Fibre:**
  (i) **Scouring:** Sheared hair is cleaned and washed in tanks to remove grease, dust and dirt.
  (ii) **Soritng:** Cleaned hair is sent to a factory where hair of different textures are separated.
  (iii) Hair is sent into a 'Carding' machine where the loose wool fibres are combed into a sheet and then twisted into a rope or silver.
  (iv) This silver is twisted and stretched into a yarn.
  (v) The yarn is wound to form balls of wool.

Chapter – 4

Heat

- **Heat:** It is a fomr of energy, which makes any object hot or cold.
- **Temperature:** Our sense of touch is not always a reliable guide to the degree of hotness of an object.
- Temperature is a measure of the degree of hotness of an object.
- Thermometer is a device used for measuring temperatures.
- Heat is the cause of temperature.
- Clinical thermometer is used to measure our body temperature. The range of this thermometer is from 35°C to 42°C. For other purposes, we use the laboratory thermometers. The range of these thermometers is usually from –10°C to 110°C.
- The normal temperature of the human body is 37°C.
- In solids, generally, the heat is transferred by conduction. In liquids and gases the heat is transferred by convection. No medium is required for transfer of heat by radiation.
- The materials which allow heat to pass through them easily are conductors of heat.
- The materials which do not allow heat to pass through them easily are called insulators.
- **Clinical Thermometer:** It is a thermometer used to measure the temperature of our body. It consists of a long, narrow, uniform glass tube with a bulb containing mercury at one end. There is a kink near the bulb. It reads a range of temperatures from $35°C$ to $42°C$.
- **Laboratory Thermometer:** It is a thermometer used to measure the temperature of objects other than our body. It consists of a column of mercury enclosed in a glass casing. The column is continuous without any kink. It measures a range of temperature from $-10°C$ to $110°C$
- **Sea Breeze:** Durign the day, the land heats up faster than the sea.
  Warm air above the land rises and colded air from sea takes its place.
  Warm air from the land moves towards the sea to compele the cycle.
  This produces a sea breeze from the sea to the land.
- **Land Breeze:** At night the land cools faster than sea.
- The warm air above the sea rises.
- This warm air is replaced by colder air from the land producing a land breeze.

Key Notes

- **Transfer of Heat:** Heat flows from a hotter object to a colder object until both objects reach the same temperature.
- The heat flows from a body at a higher temperature to a body at a lower temperature. There are three ways in which heat can flow from one object to another. These are **conduction**, **convection** and **radiation**.
- **Conduction:** It is the process by which heat is transferred from the hotter end to the colder and end of an object.
- **Convection:** It is the flow of heat through a fluid from places of higher temperature to places of lower temperature by movement of the fluid itself.
- **Radiation:** It is the mode of transfer of heat in which energy is directly transferred from one place to another. It does not need any material medium
- Dark-coloured objects absorb radiation better than the light-coloured objects. That is the reason we feel more comfortable in light-coloured clothes in the summer.
- Woollen clothes keep us warm during winter. It is so because wool is a poor conductor of heat and it has air trapped in between the fibres.

Chapter – 5

Acids, Bases and Salts

- There are three types of Substances: Acids, Bases and Indicators.
- **Acids:** Acids are sour in taste.
- They are corrosive in nature. A concentrated acid cuts through clothes and eats away the wool. If it falls on the skin, it can cause burns.
- They are good conductors of electricity, as they allow the passage of electric current through them.
- Types of Acids:
  (i) **Mineral Acids:** These are acids prepared from minrals present in the earth's crust.
  (ii) **Organic Acids:** These are acids produced by plants and animals (exception, hydrochloric acid).
  (iii) **Weak Acids:** These do not dissociate completely in solution. Example: nitric acid, sulphuric acid.
  (iv) **Strong Acids:** These dissociate completely in solution. Example: tartaric acid, lactic acid.
- **Neutralization**: It is the reaction between an acid and a base which results in formation of salt and water. $Acid + Base \rightarrow Salt + Water$. Example: $HCl + NaOH \rightarrow NaCl + H_2O$
- **Neutralisation in Everyday Life**:
  (i) **Indigestion**: Too much acid in stomach causes indigestion. It is neutralized by taking an antacid like milk of magnesia.
  (ii) **Ant sting**: When an ant bites, it injects formic acid into the skin. The effect is neutralized by rubbing moist baking soda (sodium hydrogencarbonate) or calamine (containing zinc carbonate).
  (iii) **Soil treatment**: When the soil is too acidic, it is neutralized by treating with quicklime (calcium oxide) or slaked lime (calcium hydroxide).
- Acid turns blue litmus red. Bases turn red litmus blue.
- Substances which are neither acidic nor basic are called neutral.
- Solutions of substances that show different colour in acidic, basic and neutral solutions are called indicators.

Key Notes

- An acid and a base neutralise each other and form a salt. A salt may be acidic, basic or neutral in nature.
- **Bases:** Bases are bitter in taste and soapy to touch.
- Two types of Bases:
  (i) **Weak Bases:** These naturally produce less hydroxide ions in solution. Example: magnesium hydroxide, ammonium hydroxide.
  (ii) **Strong Bases:** These produce more number of hydroxide ions on dissolving in water. Example: caustic soda, caustic potash.
- **Indicators:** It is special chemical that changes its colour to indicate the presence of a chemical substance.
- It is used to confirm the presence of an acid, a base or a neutral solution.
- **Classificaiton of Indicators:**

  Natural Indicators:

  (i) **Litmus:** It is extracted from lichens. It is available in the form of strips of paper or in the form of a solution.
  (ii) **Turmeric:** It remains yellow in neutral and acidic solutions but turns red in alkaline solutions.
  (iii) **China rose:** It turns acidic solutions to dark pink (magenta) and basic solution to green.
  (iv) **Red cabbage:** It turns acidic solutions to red and basic solutions to blue.

  Other Indicators:

  (i) **Methyl Orange**: It gives pinkish red colour with acidic solutions and yellow colour with bases.
  (ii) **Phenolphthalein**: It is an acid-base indicator. It is colourless in acidic solutions but turns pink in alkali solutions.

Chapter – 6
Physical and Chemical Changes

- Changes can be of two types, physical and chemical.
- **Physical changes** are changes in the physical properties of substances. No new substances are formed in these changes. These changes may be reversible. Example: dissolution of sugar in water, glowing of an electric bulb, tearing of paper.
- **Chemical Changes** are changes in which the composition and chemical properties of the substance get changed. In chemical changes new substances are produced. This change is permanent and irreversible. Example: burning of a candle, formation of curd from milk, ripening of fruits.
- **Chemical Reactions in Every day Life**:

  Rusting of Iron: Rust is a reddish-brown flaky substance that forms on the surface of iron objects after the process of rusting.

  Cooking of food: Cooking causes breakdown of complex molecules of carbohydrates, fats and proteins into smaller molecules.

  It is regarded as a decomposition reaction. Cooked food is easier to digest than uncooked food.

  Decay of Organic Substances: Microorganisms like fungi and bacteria produce enzymes which break down complex organic compounds into smaller substances.

  It is also regarded as a decomposition reaction.

  Prevention of Rusting:

  By Painting

  By Oiling and greasing

  By Chromium plating

  By Galvanizing

  By Alloying
- Some substances can be obtained in pure state from their solutions by crystallisation.

Chapter – 7

Weather Climate and Adaptations to Climate

- **Weather:** Weather is the day-to-day condition of the atmosphere at a place influenced by factors like humidity, temperature, wind speed, etc.
- **Humidity** is the amount of water vapour present in the atmosphere and is measured by a hygrometer.
- Sun causes all weather changes.
- **Climate:** It is the average weather conditions at a specific place over a much longer period of time.
- **Factor affecting climate:**
  (i) Amount of sunshine
  (ii) Whether the region is hilly or a plain
  (iii) Distance from the sea
  (iv) Direction of prevailing winds from the sea side brings rain to coastal areas and dry weather to inland areas.
  (v) Ocean currents.
  (vi) Distance from the equator.
- **Adaptations to Climate:** The features and habits that help animals to live in a habitat are called adaptations.
- **Three regions are classified according to adaptation:**
  (i) **Polar Regions**: Polar regions have extreme climate. Sun does not rise at poles for 6 months and does not set for the other 6 months.
  (ii) **Tropical Rainforest**: Have hot summers and plenty of rainfall. Days and nights are almost equal in length throughout the year.
  (iii) **Desert**: Have extreme climate. Receive less rainfall and large amount of sunlight.
- **Migration:**
  (i) It is the mass movement of animals, mostly birds, from colder places to warmer regions to escape the cold, to breed or due to shortage of food.
  (ii) Birds are guided by the sun during the day and the stars at night.
  (iii) Example: Siberian crane comes to India from Siberia every year.

Chapter – 8

Winds Stroms and Cyclones

- **Air:** The invisible gaseous substance surrounding the earth, a mixture mainly of oxygen and nitrogen.
- **Properties of Air:**
  (i) Air around us exerts pressure.
  (ii) Air expands on heating and contracts on cooling.
  (iii) Warm air rises up, whereas comparatively cooler air tends to sink towards the earth's surface.
  (iv) As warm air rises, air pressure at that place is reduced and the cooler air moves to that place.
- **Wind:** The moving air is called wind. Air moves from region of high air pressure to region of low air pressure.
- **Types of Wind:**
  (i) **Wind Currents**: Wind currents are generated due to uneven heating on earth. Uneven heating on the earth is the main cause of wind movements.
  (ii) **Thunderstorms**: Storm with thunder and lighting along with rain.
- Winds carrying water vapour bring rain.
- High-speed winds and air pressure difference can cause cyclones.
- It has become easier to monitor cyclones with the help of advance technology like satellites and radars.
- Self-help is the best help. Therefore it is better to plan in advance and be ready with defence against any approaching cyclone.
- The following flow chart will help you to understand the phenomena that lead to the formation of clouds and falling of rain and creation of storms and cyclones.

Chapter – 9
Soil

- Soil is the uppermost crust that covers the earth. It is a mixture of rock particles and humus.
- Soil is important for life on the earth.
- **Formation of Soil:**
  (i) Soil is formed by weathering or disintergration of parent rocks.
  (ii) Physical weathering is degradation of rocks by physical agents like water, ice, wind, sun, etc.
  (iii) Chemical weathering is chemical decomposition of rocks.
  (iv) Biological weathering is decomposition of parent rocks by bacteria and microorganisms.
- **Soil Profile**: It is the vertical section of soil from the ground surface to the parent rock. Soil profile is a section through different layers of the soil, Various layers are called horizons.
- **Constituents of Soil**: Soil consists of both living and non-living matter. These constituents make the soil fertile.
- **Types of Soil**: Soil is of different types: clayey, loamy and sandy.
- **Sandy soil**: It contains soil particles with a diameter of 0.2 to 2.0 mm. It comprises of around 60% sand along with some clay. It has very low water retention capacity. It is not rich in humus.
- **Clayey soil**: It contains soil particles with a diameter of less than 0.2 mm. It has an excellent water retention capacity and air circulation is sufficient.
- **Loamy soil**: It contains a good mixture of sand, clay and humus. It has a good water retention capacity and air circulation is sufficient.
- Percolation rate of water is different in different types of soil. It is highest in the sandy soil and least in the clayey soil.
- Different types of soils are used to cultivate different types of crops. Clay and loam are suitable for growing wheat, gram and paddy. Cotton is grown in sandy loam soil.
- Soil holds water in it, which is called soil moisture. The capacity of a soil to hold water is important for various crops.
- Clayey soil is used to make pots, toys and statues.

Chapter – 10

Respiration in Organisms

- Respiration is essential for survival of living organisms. It releases energy from the food.
- The oxygen we inhale is used to breakdown glucose into carbon dioxide and water. Energy is released in the process.
- The breakdown of glucose occurs in the cells of an organism (cellular respiration).
- During heavy exercise when the supply of oxygen to our muscle cells is insufficient, food breakdown is by anaerobic respiration.
- **Types of Respiration**:
  (i) **External Respiration:** Process in which oxygen is taken inside the body and carbon dioxide is given out. It is also called breathing.
- **External Respiration:**

  Respiration in Plants: Leaves have pores called stomata for gaseous exchange by diffusion. Stems have openings called lenticels for gaseous exchange by diffusion. Roots have stomatal pores for gaseous exchange of oxygen dissolved in soil water.

  Respiration in Animals: Respiration in animals are vary according to their character like:

  Earthworm: through their skin

  Insect: through entire body surface

  Fish: respire through their gills

  Frogs: through its thin, moist and smooth skin when in water and by lungs when in land

  Respiration in Humans: Inhaled air passes through nostrils into nasal cavity and then into lungs through windpipe.
- Breathing is a part of the process of respiration during which an organism takes in the oxygen-rich air and gives out air rich in carbon dioxide. The respiratory organs for the exchange of gases vary in different organisms.
- During inhalation, our lungs expand and then come back to the original state as the air moves out during exhalation.
- Increased physical activity enhances the rate of breathing.
- In animals like cow, buffalo, dog and cat the respiratory organs and the process of breathing are similar to those in humans.

- **Internal Respiration:** Process in which food is broken down in body cells through various chemical reactions.
- Internal respiration are further classified into two parts:
  (i) **Aerobic Respiration**: Food molecules are combined with oxygen and get oxidized inside cell into carbon dioxide and water along with energy.
  (ii) **Anaerobic Respiration**: Food molecules are broken without using oxygen along with release of energy.

Chapter – 11

Transportation in Animals and Plants

- In most animals the blood that circulates in the body distributes food and oxygen to different cells of the body. It also carries waste products to different parts of the body for excretion.
- Circulatory system consists of the heart and blood vessels.
- In humans, blood flows through arteries and veins and the heart acts as a pumping organ.
- Blood is the fluid which flows in blood vessels. It transport substance like digested food from the small intestine too the other parts of the body.
- Blood consists of plasma, RBC, WBC and platelets. Blood is red due to the presence of a red pigment, haemoglobin.
- The human heart beats about 70ñ80 times per minute in an adult person. This is called heart rate.
- Arteries carry blood from the heart to all parts of the body.
- Veins carry blood from all parts of the body back to the heart.
- Removal of waste products from the body is called excretion.
- Excretory system of humans consists of two kidneys, two ureters, a urinary bladder, and urethra.
- Salts and urea are removed along with water as sweat.
- Fish excrete waste substances such as ammonia which directly dissolve in water.
- Birds, insects and lizard excrete uric acid in semi-solid form.
- Water and mineral nutrients are absorbed by roots from the soil.
- Nutrients are transported along with water to the entire plant via the vascular tissue called xylem.
- The vascular tissue for the transport of food to the various parts of the plant is phloem.
- A lot of water is lost by plants in the form of vapour through stomata during transpiration.
- Transpiration generates a force which pulls up water absorbed by the roots from the soil, to reach the stem and leaves.

Chapter – 12

Reproduction in Plants

- All organisms multiply or reproduce their own kind.
- In plants there are two modes of reproduction, asexual and sexual.
- There are several methods of asexual reproduction such as fragmentation, budding, spore formation and vegetative propagation.
- Sexual reproduction involves the fusion of male and female gametes.
- In vegetative propagation new plants are produced from different vegetative parts such as leaves, stems and roots.
- Flower is the reproductive part of a plant.
- A flower may be unisexual with either the male or the female reproductive parts.
- A bisexual flower has both the male and the female reproductive parts.
- The male gametes are found inside the pollen grains and female gametes are found in the ovule.
- Pollination is the process of transfer of pollen grains from the anther of one flower to the stigma of the same or another flower.
- Pollination is of two types, self-pollination and cross-pollination. In self-pollination, pollen grains are transferred from the anther to the stigma of the same flower. In cross-pollination, pollen grains are transferred from the anther of one flower to the stigma of another flower of the same kind.
- Pollination takes place in plants with the help of wind, water and insects.
- The fusion of male and female gametes is called fertilisation.
- Fertilised egg is called zygote. Zygote develops into an embryo.
- Fruit is the mature ovary whereas ovule develops into a seed, which contains the developing embryo.
- Seed dispersal is aided by wind, water and animals.
- Seed dispersal helps the plants to
  (i) prevent overcrowding,
  (ii) avoid competition for sunlight, water and minerals and
  (iii) invade new habitats.

Chapter – 13

Motion and Time

- **Motion: T**he action or process of moving or being moved.
- The distance moved by an object in a unit time is called its speed.
- Speed of objects help us to decide which one is moving faster than the other.
- The speed of an object is the distance travelled divided by the time taken to cover that distance. Its basic unit is metre per second (m/s).
- Periodic events are used for the measurement of time. Periodic motion of a pendulum has been used to make clocks and watches.
- Motion of objects can be presented in pictorial form by their distance-time graphs.
- The distance-time graph for the motion of an object moving with a constant speed is a straight line.
- **Types of Motion:**
  (i) **Uniform motion:** An object moving along a straight line with a constant speed is said to be in uniform motion. The average speed is the same as the actual speed.
  (ii) **Non-Uniform motion:** If the speed of an object moving along a straight line keeps changing, its motion is said to be non-uniform.
- **Speed:** It is the distance covered by an object in a unit time. Basic unit of speed is m/s.

$$\text{Speed} = \frac{\text{Total distance covered}}{\text{Total time taken}}$$

- **Distance-Time Graph:** Motion of objects can be presented in pictorial form by their distance-time graphs. The distance-time graph for the motion of an object moving with a constant speed is a straight line.

Chapter – 14

Electric Current and its Effects

- **Electric Current:** Flow of electrons through a conductor.
- It is convenient to represent electric components by symbols. Using these, an electric circuit can be represented by a circuit diagram.
- When an electric current flows through a wire, the wire gets heated. It is the heating effect of current. This effect has many applications.
- Wires made from some special materials melt quickly and break when large electric currents are passed through them. These materials are used for making electric fuses which prevent fires and damage to electric appliances.
- When an electric current flows through a wire, it behaves like a magnet.
- **Electric Circuit:** A complete pathway of the flow of electric current.
- **Component of Electric Circuit:**
  (i) **Cell:** Provides energy for the current to flow.
  (ii) **Bulb:** Lights ups when an electric current flows through it.
  (iii) **Switch:** Keeps the circuit off or on.
  (iv) **Connecting wires:** Help to conduct the electric current and complete the circuit.
- **Effects of Electric Current**:
  Heating Effect: The wire gets hot when an electric current passes through it. This is the heating effect of the electric current. Electric heater contains a coil of wire called element which becomes red hot when current passes through it. The amount of heat produced in a wire depends on its material, length and thickness.
  (i) **Fuse**: It is a safety device which prevents damage to electric circuit. It is made by inserting a short wire into porcelain or insulating material.
  (ii) **MCB**: Stands for Miniature Circuit Breakers. These are switches which automatically turn off when current in a circuit exceeds the safe limit.
  Magnetic Effect: When electric current passes through a wire, it behaves like a magnet. This is the magnetic effect of the electric current. First observed by Hans Christian Oersted.
- A current carrying coil of an insulated wire wrapped around a piece of iron is called an electromagnet.
- **Electromagnet:** An electromagnet is a coil of wire wound on a soft iron core. Used to separate magnetic material from the junk. Doctors use tiny electromagnets to take out small pieces of magnetic material that have accidentally fallen in the eye. Many toys also have electromagnets inside them.

Chapter – 15

Light

- **Light:** It is the natural agent that stimulates sight and makes things visible.
- Light travels along straight lines.
- Any polished or a shining surface acts as a mirror.
- An image which can be obtained on a screen is called a **real image**. It formed by light rays that actually pass through the screen.
- An image which cannot be obtained on a screen is called a **virtual image**. It is formed by light rays that seem to pass through the screen.
- The image formed by a plane mirror is erect. It is virtual and is of the same size as the object.
- The image is at the same distance behind the mirror as the object is in front of it.
- In an image formed by a mirror, the left side of the object is seen on the right side in the image, and right side of the object appears to be on the left side in the image.
- A **concave mirror** can form a real and inverted image. When the object is placed very close to the mirror, the image formed is virtual, erect and magnified.
- A **Convex mirror** is the mirror that curves out; the reflecting surface is convex. Image formed is virtual, upright and diminished. Image formed by a convex mirror is erect, virtual and smaller in size than the object.
- A **Concave lens** is the lens that is thinner at the centre than at the edges. It is a diverging lens. Image formed is virtual, erect and diminished.
- A **convex lens** can form real and inverted image. When the object is placed very close to the lens, the image formed is virtual, erect and magnified. When used to see objects magnified, the convex lens is called a magnifying glass.
- White light is composed of seven colours.
- **Properties of Light**:
  Rectilinear Propagation of Light: It is the property of light to travel in a straight line in any direction. The direction of path in which light make a ray.
  Reflection of Light: It is the bouncing back of light after striking the surface of an object. Shiny smooth surfaces reflect almost all the light.
  Dispersion: It is the phenomenon of splitting of white light into its seven colours. White light is mixture of: Violet, Indigo, Blue, Green, Yellow, Orange and Red (VIBGYOR) colours.

Chapter – 16

Water: A Precious Resource

- Water is essential for all living beings. There can be no life without it.
- Water exists in three forms: solid, liquid and vapour.
- **Solid:** At poles of earth, snow-covered mountains and glaciers.
- **Liquids:** In oceans, lakes, rivers and underground.
- **Gaseous:** Water vapour in air.
- **Surface water:** Sea and oceans, Rivers, Springs, Lakes and Ponds.
- **Ground water:** It is the water that sweeps into the ground through soil and collects over non-porous rocks (aquifier). Level of groundwater at any place is called water table. Groundwater gets recharged by seepage of water into the ground (infiltration).
- **Water scarcity:** Depletion of water table:
  (i) Increase population decreases open areas which decreases seepage of rainwater.
  (ii) Increasing industries more water is drawn out from ground.
  (iii) Agricultural activities irrigation systems fail due to erratic rainfall which results in increased used of ground water.
  (iv) Uneven distribution of rainfall.
  (v) Scanty rainfall.
  (vi) Deforestation.
- Though water is maintained by the water cycle, yet there is an acute scarcity of water in many parts of the globe.
- There is an uneven distribution of water. Much of it has resulted from human activities.
- Rapid growth of industries, increasing population, growing irrigation requirements and mismanagement are some of the causes for water shortage.
- We need to be worried about the wastage during the supply of water through pipes, the leaking taps in buildings and other places.
- Unnecessary use of water and overdrawing from groundwater should be avoided. Recharge of water to the ground should be increased.
- The need of the hour is that every individual uses water economically.
- Plants wilt and ultimately dry-up if they are not watered for a few days.

Chapter – 17

Forests: Our Lifeline

- **Forest:** Large area of land thickly covered with trees, bushes, etc.
- We get various products from the forests surrounding us.
- Forest is a system comprising various plants, animals and micro-organisms.
- In a forest, trees form the uppermost layer, followed by shrubs. The herbs form the lowest layer of vegetation.
- Different layers of vegetation provide food and shelter for animals, birds and insects.
- The various components of the forest are interdependent on one another.
- The forest keeps on growing and changing, and can regenerate.
- In the forest, there is interaction between soil, water, air and living organisms.
- Forests protect the soil from erosion.
- Soil helps forests to grow and regenerate.
- Forests are the lifeline for the forest-dwelling communities.
- Forests influence climate, water cycle and air quality.
- **Importance of Forests**:
  (i) Provide timber.
  (ii) Purify air.
  (iii) Provide shelter.
  (iv) Prevent soil erosion.
  (v) Control floods.
  (vi) Noise absorbers.
- **Independence of Plants and Animals in Forest:**
  (i) Plnats and animals depends on each other to remain alive.
  (ii) All organisms interact with each other and their physical environment to derive energy and survive.
- **Conservation of Forest:**
  (i) Amount of carbon dioxide in air will increase, resulting in the increase of earth's temperature.
  (ii) Animals will not get food and shelter.

(iii) Soil will not hold water, which will cause floods.

(iv) Endanger lives and environment.

- **Conservation of Forests**:

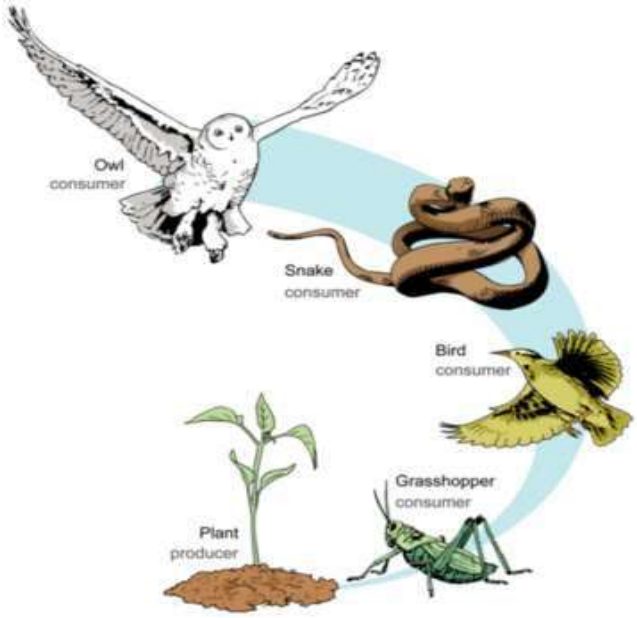
(i) Do not allow overgrazing.

(ii) Promote afforestation.

(iii) Protect wildlife.

(iv) Control forest fires.

- **Food Chain**: Interdependence between producers and consumers studied in form of various linkage that appears as a chain.



- **Food Web**: A system of interdependent food chains used to represent various relationships of organisms.

Chapter – 18
Wastewater Story

- **Wastewater:** Rich in lather, mixed with oil, black-brown water that goes down the drains from skins, showers, toilets, laundries is called wastewater.
- Wastewater is generated in homes, industries, agricultural fields and in other human activities. This is called sewage.
- Sewage is a liquid waste which causes water and soil pollution.
- Wastewater is treated in a sewage treatment plant.
- Treatment plants reduce pollutants in wastewater to a level where nature can take care of it.
- Where underground sewerage systems and refuse disposal systems are not available, the low cost on-site sanitation system can be adopted.
- By-products of wastewater treatment are sludge and biogas.
- Open drain system is a breeding place for flies, mosquitoes and organisms which cause diseases.
- We should not defecate in the open. It is possible to have safe disposal of excreta by low cost methods.
- **Sewage Treatement**:
  (i) **Aeration:** Air is bubbled throught the wastewater while it is continuously stirred.
  (ii) **Filtration:** Aerated water passes through a deep filter of layered sand, fine gravel and medium gravel.
  (iii) **Chlorination:** To the filtered water chlorine is added and mixed until water is clear.
- **Wasterwater Treatemetn Plant (WWTP)**:
  (i) Wastewater passes through screens to remove large objects.
  (ii) To goes to a grit and sand removal tank at low speed.
  (iii) Water is allowed to settle in large tank.
  (iv) Floating solids are removed with skimmer. Settled solids (sludge) are removed with scraper.
  (v) Clear water is called clarified water.
  (vi) Water is then decomposed by anaerobic bacteria in a tank and air is passed.
  (vii) Microbes settled at bottom as activated sludge and water from top is removed.