Points to remember

Unit – IV (CHE11O)

- Pollution: Introduction of contaminants into the natural environment that cause adverse change.
- Pollutant: Pollutants, the components of pollution, can be either foreign substances/energies or naturally occurring contaminants.
- Primary air pollutants: Harmful chemicals that are released directly from a source into the atmosphere. E.g., particulate matter, carbon monooxide, sulfur dioxide etc.
- Secondary air pollutants: Produced from chemical reactions involving the primary pollutants. E.g., Ozone, PAN (Peroxy acetyl nitrate) etc.
- Major air pollutants: Carbon Monoxide, Carbon Dioxide, CFCs, Ozone, Nitrogen oxide, Sulphur dioxide, Suspended Particulate Matter (SPM).
- Causes of air pollution: Natural (volcanic eruption, forest fire, cyclone methane from microorganisms etc.), anthropogenic (industries, automobiles, thermal power plants, nuclear explosion, agricultural activities, disposal of garbage, mining activities).
- Effects of air pollution on human health: Carboxyhaemoglobin, inflammation of lungs, damage to respiratory system and blood vascular system, cancer.
- Effects of air pollution on plants: Bleaching of the leaf pigment, development of necrotic spots, premature falling of leaves.
- Effects of air pollution on climates: Greenhouse effect and global warming, Acid rain, Ozone (O_3) layer depletion.
- Prevention of air pollution: Adopting cleaner technologies, reducing pollution at the source, implementing laws and regulations to make people pollute less, introducing appropriate transportation policies, making cleaner and fuel-efficient vehicles.
- Control of air pollution: fitting smokestacks with electrostatic precipitators, fabric filters, scrubbers, or similar devices, sprinkling water on soil that is being evacuated during road construction.
- Air quality index (AQI): It is an index for reporting daily air quality.
- Indoor air pollution: Solvents used for polishing contain harmful chemicals that causes air pollution inside the room.
- Causes of water pollution: Natural (Soil erosion [due to rain, floods, high speed wind], Deposition of dead and decaying remains of plants and animals), anthropogenic (Sewage and other wastes [papers, cloth, soap, detergents], Industrial effluents [oil, grease, plastic, metals, acids and other toxic chemicals], Agricultural waste [fertilizers, pesticides], Human activities [bathing, clothing, washing], Customs and traditions [disposal of dead bodies, immersion of idols of gods]).

- Types of the sources of water pollution: (1) point source (Pollutants enter the water at a single point. E.g., sewage treatment plant and factories. These can be regulated through law), (2) non-point source (pollutants enter the water over large areas. E.g., Surface run off, mining wastes, municipal wastes, acid rain and soil erosion).
- Major water pollutants and their effects:
  - Sediments (soil particles carried by flowing water): increases the turbidity water and reduces photosynthesis, destroys feeding ground of fishes, clogs reservoirs and channels.
  - Oxygen-demanding wastes (Organic waste such as animal manure and plant debris that are decomposed by bacteria): They come from sewage, animal feedlots, paper mills, food processing facilities, etc. These bacteria deplete the oxygen and causes death of fish.
  - Infectious microorganisms (Parasitic worms, viruses, pathogen and bacteria from infected organisms as well as human and animal wastes): They are responsible for water borne diseases.
  - Organic compounds (Synthetic chemicals industrial effluents, surface runoff, and cleaning agents): These chemicals causes health problems for humans and harm fishes.
  - Inorganic nutrients (nitrogen and phosphorus from animal waste, plant residues, fertilizer runoff): It causes eutrophication.
  - Inorganic chemicals (Acids, salts, and heavy metals like lead and mercury from industrial effluents, surface runoff, and household cleaning agents): They make water unfit for use and harms aquatic life.
  - Radioactive substances (Wastes from nuclear power plants, nuclear weapons production, mining and refining uranium and other ores) Such substances causes cancer and birth defects.
  - Thermal pollution (Hot water from industrial processes): Heat lowers oxygen demand and makes aquatic life more vulnerable to diseases, parasites. Thermal shock in aquatic organisms.
- Causes of groundwater pollution: Natural (over-extraction of groundwater causes fluoride and arsenic contamination), Anthropogenic (leaching of pollutants from septic tanks, landfills, hazardous waste dumps, and underground oil tanks).
- Eutrophication: Excessive growth of algae in standing water body. Caused by the enrichment of nutrients, such as phosphorus and nitrogen. Decomposition of dead algae requires dissolved oxygen, oxygen deficiency occurs and aquatic animals die.
- Control of water pollution: Treatment of domestic and industrial wastewater, Control on excess use of fertilizers and pesticides, ban on disposal of non-biodegradable waste (such as plastic) in water bodies, Strict enforcement of rules, Public awareness.

- Major soil pollutants (causes of soil pollution): Heavy Metal (Lead, Cadmium etc.), Domestic waste, Mining waste, Chemical waste, Agricultural waste (Pesticides and fertilizers), Radioactve waste.
- Effects of soil pollution: Reduction of the fertility of the soil, increase in the number of mosquitoes and flies, which are vectors of several deadly diseases, Reduces the aesthetic value of land, Radioactive elements present in polluted soil enter human body and cause cancer, deformities in bones, etc.
- Control of soil pollution: Treatment of industrial waste before being disposed to reduce soil pollution, Segregation of domestic waste into biodegradable and non-biodegradable waste. Biodegradable waste can be used for production of manures and biogas, non-biodegradable waste can be recycled and reused, Planting of trees must be encouraged, Reduction in the amount of radioactive materials released in the soil, Reduction in the use of chemical fertilizers and pesticides, Solid waste can be used for electricity generation.
- Bioremediation: breaking down the pollutants by microorganisms.
- Phytoremediation: breaking down the pollutants by plants.
- Control of thermal pollution: Cooling Ponds (hot effluents stored in a pond are cooled down by atmosphere), Cooling Towers (hot effluents are cooled down using water), co-generation (using heat from effluents for other industrial purpose).
- Causes of marine pollution: Chemical runoff from industry, Oil spillages, disposal of domestic waste in ocean, oil and chemicals from ship maintainance activities.
- Effects of marine pollution: plastic and other litter can choke aquatic animals like fish, turtle etc., oil or litter can block out the sunlight from sea plants which need sunlight for photosynthesis, people are harmed by swimming in a polluted sea.
- Control of marine pollution: beach cleanup programs, controlling oil spillage, preventing the disposal of plastics in ocean, campaigning and writing articles in news papers and social media.
- Noise pollution: The unwanted noise dumped into the atmosphere that leads to discomfort and health hazards is known as noise pollution.
- Sources of noise pollution: Natural phenomena (volcanic eruptions, thunder, storms, etc.), Domestic appliances (mixers, washing machines, telephones, music system, radio, television etc.), Industries (machines in mills and factories), Automobiles (horns of vehicles, Trains, ships, and aircrafts), fire crackers, loudspeakers in social gatherings and festivals etc.
- Effects of noise pollution: effects on human beings (temporary and permanent deafness or hearing loss, loss of concentration, loss of working efficiency, insomnia [sleeplessness], heart attack etc.), effect

on wildlife (habitat loss, difficuulty in communiication, birds stop laying eggs etc.).

- Control of noise pollution: Control at receptor (ear-protection aids like earplugs, noise helmets, headphones), designing, fabricating noisy machines, using quieter machines, proper lubrication and maintenance of machines, Installing noisy machine in soundproof chamber, Using silencer in automobiles, ducts exhausts etc., Covering noise-producing machine parts with sound absorbing materials, Reducing the noise production from a vibrating machine by vibration damping (using rubber, neoprene etc.), Acoustic zoning (Increasing the distance between the source and receiver by zoning of noisy industrial areas, bus terminals and Railway stations away from the residential areas), Planting of trees and shrubs along roads, hospitals, educational institutions, Legislative measures (strict laws must be enforced to minimize loudspeakers, amplifires, Banning pressure horns in automobiles, Framing a separate Noise Pollution Act.)
- Causes of radiation pollution: Radioactive waste from nuclear power plants, Nuclear explosions, Medical use (x-rays, radio-isotopes), Radiations from luminous watches, clock dials, X-rays from microwave, etc.
- Effects of radiation pollution: Somatic Effects (skin cancer, bone cancer, reduction of life span, premature ageing etc.),Genetic Effects-Change in DNA (Increase in the number of abnormal children and increased infant mortality).
- Control of radiation pollution: Dense trees should be planted around atomic power plants, Proper management of radioactive waste should be ensured, Unnecessary X-ray examination should be avoided. Lead shields should be used by workers, During nuclear installations, various efforts including the process of site selection, its design, construction, operation, and its short-term and long-term effects should be seriously considered.
- Garbage: Garbage refers to the putrescible solid waste (Solid waste that contains organic matter capable of being decomposed by microorganisms) constituents produced during the preparation or storage of meat, vegetables, etc.
- Rubbish: Rubbish is the non-putrescible solid waste constituents, either combustible or non combustible. Combustible waste includes paper, wood, scrap, rubber, leather, etc. Non-combustible wastes are metals, glass, ceramics etc.
- Refuse: Refuse means all decomposing and non-decomposing combustible and non-combustible solid wastes such as garbage, ashes, paper, cans, wood scraps, plastic etc.

- Sources of soild waste: Domestic garbage (household wastes such as plastic, paper, glass pieces, metal objects etc.), Pathological wastes (dead animals and human waste), Industrial wastes (chemicals, paints, sand, metal ore processing, fly ash, sewage treatment sludge, etc.), Agricultural wastes (farm animal manure and crop residues), Municipal Solid waste – MSW (trash or garbage, consists of everyday items such as product packaging, furniture, bottles etc.), Mining wastes (generates from mining activities. Eg. Heavy metals), Radioactive wastes (generated from nuclear explosions, nuclear testing, use of radioactive substances in medical and scientific research etc.), Hospital wastes (can also be called biomedical waste [BMW], e.g., disposable needles, syringes, blades, tissues etc.)
- Effects of soild waste: harbors disease-causing organisms such as mosquitoes, flies, etc., water pollution (It runs off with rainwater and mixes with the nearby water bodies), air pollution (burning of solid waste, burning of polythene, plastic, rubber, etc. releases toxic gases), reduces the aesthetic value of land,
- Objective of soild waste management: The main objective of solid waste management is to minimize these adverse effects before it becomes too difficult to rectify in the future.
- Steps of solid waste management: Collection of solid waste, Transportation of solid waste, Disposal of solid waste.
- Solid waste collection process: collection of solid wastes in dustbins according to categories, Door to door collection of domestic garbage, collection and segregation of recyclable material from the waste by rag pickers.
- Disposal of soild waste: Open dumping, Land fill, Ocean dumping, incineration (burning of solid waste in controlled condition), Composting (decomposition of waste by microorganism in the presense of oxygen).
- 5 Rs in solid waste management: Refuse (generate fuel from refuse),Reduce (reduce waste generation),Reuse (using a waste material without changing its form), Repair (repairing the damaged product instead of throwing it away),Recycle (using a waste material after changing its form).
- Ill effects of fireworks: Fire Hazards (fireworks can set fire to huts, heaps of dry grass and even houses), Noise Pollution (Firecrackers make more noise than the allowed decibel limit), Air Pollution (Components of the smog caused by firecrackers are harmful when inhaled. Such as, Copper causes irritation in the respiratory tract. Cadmium causes anaemia. Lead in the body has a harmful effect on the nervous system. Magnesium: Magnesium and zinc fumes cause metal fume fever). Smokes from fireworks causes reduced visibility.