Points to remember

Unit – V (CHE110)

- Greenhouse effect indicates heat-trapping process caused by gases such as carbon dioxide, and water vapour etc.
- Greenhouse gases transparent to incoming solar radiations but re-emit the infrared radiations from Earth's surface.
- Global warming is a long-term rise in the average temperature of Earth as a whole as a result of greenhouse effect.
- Process of greenhouse effect: Shorter, high energy wavelengths hit the earth surface. Then incoming energy is converted to heat. Longer, infrared wavelengths hit greenhouse gas molecules in the atmosphere.Then greenhouse gas molecules in the atmosphere emit infrared radiation back towards earth.
- Examples of greenhouse gases: Carbon dioxide (CO_2), Methane (CH_4), Nitrous oxide (N_2O), Chlorofluoro carbons (CFCs) etc.
- Source of greenhouse gases: Fossil-fuel (coal, petroleum derived fuels) burning, Industrial processes (CO_2 emission), Deforestation (less absorption of CO_2 causes increased CO_2 concentration), Livestock (Cattle wastes), Biomass burning, Coal mining.
- Effects of CO_2 concentration increase: Air and the Earth's surface may grow warmer, The stratosphere may become cooler, Temperate and polar regions may become warmer leading to the reduction in the ice cover of the earth, Rainfall may be higher than what it is present in the temperate regions, The greater amount of evaporation due to excess warmth.
- Effects of Global warming: Climate change, Rise in sea level, Reduced agricultural production, Storms, Adverse effects on human health, Loss of ecosystems and biodiversity.
- Control of global warming: Reduction in the use of fossil fuels, Shifting to the renewable energy sources that do not emit greenhouse gases, Increasing the use of energy efficient and cleaner production technologies and practices, Reducing deforestation, adopting better forest management practices, and undertaking afforestation to sequester carbon.
- Carbon sequestration: A natural or artificial process by which carbon dioxide is removed from the atmosphere and held in solid or liquid form.
- Acid rain refers to a condition in which natural precipitation becomes acidic after reacting chemically with pollutants in the air.
- Causes of acid rain: Burning of the fuel as well as the use of nuclear weapons leading to the evolution of large amounts of sulphur dioxide

(SO2) and nitrogen dioxide (NO2), which get converted to sulphurous acid and nitric acid, respectively.

- Effects of Acid Rain: Reduction in population of aquatic biota, Damage to terrestrial ecosystems, Corrosion of buildings, Effect on human beings (exposure of skin to acid rain).
- Ozone layer: It is a layer in the earth's stratosphere at an altitude of about 10 km (6.2 miles) containing a high concentration of ozone, which absorbs most of the ultraviolet radiation reaching the earth from the sun.
- Ozone layer depletion: The decrease in the concentration of ozone (O3) in stratosphere is known as ozone layer depletion.
- CFCs (Chlorofluorocarbons) are the main cause of ozone layer depletion.
- CFCs are powerful O3 destroyers. They are used as coolants in the compressors of refrigerators and air conditioners, to clean electronic circuit boards used in computers, telephones, etc., in the manufacture of foams for mattresses and cushions, disposable styrofoam cups, packaging material, cold storage, etc.
- Role of CFCs in ozone layer depletion:
    - Oxygen molecule naturaly breaks down in atomic oxygens in presence of radiation.
    - $O_2 \xrightarrow{UV\ C} O^{\bullet} + O^{\bullet}$
    - Oxygen molecule and oxygen atom produces ozone molecule.
    - $O_2 + O^{\bullet} \longrightarrow O_3$
    - Ozone also naturally breaks down into oxygen molecule and atom. $O_3 \xrightarrow{UV\ B} O_2 + O^{\bullet}$
    - This natural balance of ozone depletion and regeneration is affected when CFCs are introduced.
    - CFC releases atomic Cl in the presence of UV radiation.
    - $CFC \xrightarrow{UV} Cl^{\bullet}$
    - Cl atom reacts with O atom and forms ClO and consequently its dimer. $Cl^{\bullet} + O^{\bullet} \longrightarrow ClO$
    - $ClO + ClO \longrightarrow ClOOCl\ (dimer)$
    - ClOOCl forms oxygen and Chlorine molecules and eventually Cl atom. $ClOOCl \longrightarrow Cl_2 + O_2$
    - $Cl_2 \longrightarrow Cl^{\bullet} + a$
    - Cl atom becomes free to react with another oxygen atom.
- Ozone hole: The thinning of ozone layer or reduction in concentration of ozone especially over the area of Antarctic continent is known as ozone hole, which covers approximately seven million square kilometer.
- Effects of O3 Layer Depletion: Increase in the rate of skin diseases and cancers in human beings, indirectly causes global warming (Damage

to land plants, Decrease in population of aquatic community, , Disturbance in climate patterns).

- Control of ozone layer depletion: Evolving substitutes for CFCs, Development of hydrochloroflourocarbons (HCFCs) and hydrofluorocarbons (HFCs).
- Major environmental acts: Environment Protection act, Air (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act (1974), Wildlife Protection Act (1972), Forest Conservation Act (1980).
- Environment Protection act (1986): **Objective**- It provides for the protection and conservation of the Environment. **Key notes of the act** - Under the Act, a central government may provide permission for various works related to urbanization, Protection against natural hazards, Maintenance of water supply in aquifers, Protection of lines of communication and transportation, Preservation of public health.
- Air (Prevention and Control of Pollution) Act (1981): **Objective**- It provides the prevention , control and abatement of air pollution. Provisions of the Act has to be implemented by Central Pollution Control Board along with the state board. **Functions** - setting of the air quality standards, collecting data on air pollution, organizing training, awareness programmes, establishing laboratories, Specify air pollution control areas and set standard for vehicle emissions, Penalties for violation of its provisions are applied to all.
- Water (Prevention and Control of Pollution) Act (1974): **Objective**- It prevents, controls and provides maintenance or restoration of wholesomeness of water. Provisions of the Act has to be implemented by Central Pollution Control Board being a main agency.
- Wildlife Protection Act (1972): **Objective**- This act defines wildlife to include any bird or animal and aquatic or land vegetation, form part of any habitat. **Function**- Under the Act, Central government work with state governments to regulate or prohibit the conversion of forest in agriculture or urban land, Protection against natural hazards, Maintenance of water supply in water bodies present in Forest, Protection of lines of communication and transportation.
- Forest Conservation Act (1980): **Objective**- It provides for the protection and conservation of the forests. Under the Act, a state government may regulate or prohibit in any forest the clearing of land for cultivation, pasturing of cattle, or clearing the vegetation for any of these purposes. **Function**- Protection against natural hazards, Maintenance of water supply in aquifers, Protection of lines of communication and transportation, Preservation of public health, Mandatory for land owner.

- Issues involved in enforcement of environmental Laws: Illiteracy, Growing population, Ignorance, Economic reasons, Insufficiency of laws.
- Kyoto Protocol: The objective of Protocol is "Stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climatic system".
- Montreal Protocol: Designed to protect the ozone layer by phasing out the production of a number of substances believed to be responsible for ozone depletion.
- Convention on Biological Diversity (CBD): is an international legally-binding treaty with three main goals: conservation of biodiversity; sustainable use of biodiversity; and the fair and equitable sharing of the benefits arising from the use of genetic resources. Its overall objective is to encourage actions which will lead to a sustainable future. The CBD covers biodiversity at all levels: Ecosystems, species and genetic resources.
- Causes of Human-wildlife conflict: Shrinkage of habitats, Man-eating tendency, Scarcity of food, Electric wiring, Lack of corridors.
- Tribal population and rights in India: Nearly 250 million people live in and around forests in India, of which the estimated indigenous Adivasi or tribal population stands at about 100 million.