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Environmental Studies

- World Forest Day: March 21
- Earth Day: April 22
- World Environment Day: June 5
- World Population Day: July 11
- World Conservation Day: Oct. 24
- 'Environment' is derived from the French word *Environner*, which means to encircle or surround.
- Environment includes all the physical and biological surroundings of an organism along with their interactions. Environment is thus defined as 'the sum total of water, air and land and the inter-relationships that exist among them and with the human beings, other living organisms and materials'.
- In 1991, the Supreme Court of our country issued directives to make all curricula environment-oriented. This directive was, in fact, in response to a Public Interest Litigation (PIL) filed by M. C. Mehta vs. Union of India (1988).

- 'World Summit on Sustainable Development was held at Johannesberg in 2002.
- Justice Kuldeep Singh is popularly known as the green judge and M.C. Mehta, the green advocate.
- The Government of India has introduced a scheme of eco-labelling of consumer products as 'Ecomark' in 1991. It is an 'earthen pitcher'-a symbol of eco friendliness and our traditional heritage.
- The trees produce oxygen by photosynthesis.
- Big dams and river valley projects have multi-purpose uses and have been referred to as "Temples of modem India".
- The water we use keeps on cycling endlessly through the environment, which we call as Hydrological Cycle.
- A layer of sediment or rock that is highly permeable and contains water is called an aquifer. Layers of sand and gravel are good aquifers while clay and crystalline rocks (like granite) are not since they have low permeability.
- When the concentration of nitrates in the water exceeds 25 mg/L, they become the cause of a serious health hazard called "Blue Baby Syndrome" or methaemoglobinemia.
- When Nitrogen and Phosphorus fertilizers are excessively used in the agricultural fields, a large proportion of nitrogen and phosphorus may get washed off and along with runoff water reach the water bodies causing over nourishment of the lakes, a process known as **Eutrophication** (eu = more, trophic =nutrition). Due to eutrophication the lakes get invaded by algal blooms.
- About 20 species of pests are now known which have become immune to all types of pesticides and are known as "Super pests".

- **Renewable resources** which can be generated continuously in nature and are inexhaustible e.g. wood, solar energy, wind energy, tidal energy, hydropower, biomass energy, bio-fuels, geo-thermal energy and hydrogen. They are also known as non-conventional sources of energy and they can be used again and again in an endless manner.
- Non-renewable resources which have accumulated in nature over a long span of time and cannot be quickly replenished when exhausted eg. coal, petroleum, natural gas and nuclear fuels like uranium and thorium.
- Biogas is a mixture of methane, carbon dioxide, hydrogen and hydrogen sulphide, **the major constituent being methane**. Biogas is produced by anaerobic degradation of animal wastes (sometimes plant wastes) in the presence of water. Anaerobic degradation means breakdown of organic matter by bacteria in the absence of oxygen.
- There are mainly three types of coal, namely anthracite (hard coal), bituminous (soft coal) and lignite (brown coal).
- Coal is the most abundant fossil fuel in the world.
- Natural gas is the cleanest fossil fuel.
- The term Ecology was coined by Earnst Haeckel in 1869. It is derived from the Greek words ***Oikos***- home + ***logos***- study. So, ecology deals with the study of organisms in their natural home interacting with their surroundings. Now, ecology is often defined as "the study of ecosystems".
- ***Producers:*** In the ecosystems, theyare mainly the green plants, which can synthesize their food themselves by making use of carbondioxide present in the air and water in the presence of sunlight by involving chlorophyll, the green pigment present in the leaves, through the process of photosynthesis. They are also known as **photo autotrophs** (auto=self; troph=food, photo=light).

- **Consumers:** All organisms which get their organic food by feeding upon other organisms are called consumers, which are of the following types:

  (i) ***Herbivores (plant eaters):*** They feed directly onl producers and hence also known as primary consumers. E.g. rabbit, insect, man.

  (ii) Carnivores (meat eaters): They feed on other consumers. If they feed on herbivores they are called *secondary consumers* (e.g. Frog) and if they feed on other carnivores (snake, big fish etc.) they are known as *tertiary carnivores/ consumers*.

  (iii) Omnivores: They feed on both plants and animals. E.g. humans, rat, fox, many birds.

  (iv) Detritivores (Detritus feeders or Saprotrophs): They feed on the parts of dead organisms, wastes of living organisms, their cast-offs and partially decomposed matter e.g. beetles, termites, ants, crabs, earthworms etc.

- ***Decomposers:*** They derive their nutrition by breaking down the complex organic molecules to simpler organic compounds and ultimately into inorganic nutrients. Various bacteria and fungi are decomposers.

- The physical and chemical components of an ecosystem constitute its **abiotic structure**. It includes climatic factors, edaphic (soil) factors, geographical factors, energy, nutrients and toxic substances.

- The flow of energy is mediated through a series of feeding relationships in a definite sequence or pattern which is known as **food chain**. Nutrients too move along the food chain.

- The producers and consumers are arranged in the ecosystem in a definite manner and their interaction along with population size are expressed together as trophic structure.

- Each food level is known as trophic level and the amount of living matter at each trophic level at a given time is known as standing crop or standing biomass.
- The sequence of eating and being eaten in an ecosystem is known as food chain.
- Food web is a network of food chains where different types of organisms are connected at different trophic levels, so that there are a number of options of eating and being eaten at each trophic level.
- **Ecological Pyramid:** Graphic representation of trophic structure and function of an ecosystem, starting with producers at the base and successive trophic levels forming the apex is known as an ecological pyramid. Ecological pyramids are of three types:

  Pyramid of numbers: It represents the number of individual organisms at each trophic level. We may have **upright or inverted** pyramid of numbers.

  Pyramid of biomass: It is based, upon the total biomass (dry matter) at each trophic level in a food chain. The pyramid of biomass can also be **upright or inverted**.

  Pyramid of Energy: The amount of energy present at each trophic level is considered for this type of pyramid. Pyramid of energy gives the best representation of the trophic relationships and it is always **upright.** At every successive trophic level, there is a huge loss of energy (about 90%) in the form of heat, respiration etc. Thus, at each next higher level only 10% of the energy passes on.

- Homeostasis is the inherent property of all living systems to resist change.

- **Ecological Succession:** It is observed that one type of a community is totally replaced by another type of community over a period of time and simultaneously several changes also occur. This process is known as ecological succession. Ecological succession is defined as an orderly process of changes in the community structure and fraction with time mediated through modifications in the physical environment and ultimately culminating in a stabilized ecosystem known as climax.

  Ecological successions starting on different types of areas or substrata are named differently as follows:

  (i) Hydrarch or Hydrosere: Starting in watery area like pond, swamp, bog

  (ii) Mesarch: starting in an area of adequate moisture.

  (iii) Xerarch or Xerosere: Starting in a dry area with little moisture. They can be of the following types:

Lithosere	: starting on a bare rock
Psammosere	: starting on sand
Halosere	: starting on saline soil

- **Aquatic Ecosystems**: Aquatic ecosystems dealing with water bodies and the biotic communities present in them are either freshwater or marine. Freshwater ecosystems are further of standing type (**lentic**) like ponds and lakes or free-flowing type (**lotic**), like rivers.

- **Estuary:** An estuary is a partially enclosed coastal area at the mouth of a river where fresh water and salty seawater meet. The organisms present in estuaries show a wide range of tolerance to **temperature** and **salinity**. Such organisms are known as **eurythermal** and **euryhaline**. Coastal bays, and tidal marshes are examples of estuaries.

- Biodiversity refers to the variety and variability among all groups of living organisms and the ecosystem complexes in which they occur.

- Areas which exhibit high species richness as well as high species endemism are termed as hot spots of biodiversity. The term was introduced by Myers (1988).
- The International Union for Conservation of Nature and Natural Resources (IUCN) publishes the **Red Data Book** which includes the **list of endangered species of plants and animals**. The red data symbolizes the warning signal for those species which are endangered and if not protected are likely to become extinct in near future.
- A species is said to be **extinct** when it is not seen in the wild for 50 years at a stretch e.g. Dodo, passenger pigeon.
- A species is said to be **endangered** when its number has been reduced to a critical level or whose habitats, have been drastically reduced and if such a species is not protected and conserved, it is in immediate danger of extinction.
- A species is said to be in **vulnerable** category if its population is facing continuous decline due to overexploitation or habitat destruction. Such a species is abundant, but under a serious threat of becoming endangered if causal factors are not checked.
- Species which are not endangered or vulnerable at present, but are at a risk are categorized as **rare** species. These are usually localized within restricted areas i.e. they are usually endemic. Sometimes they are thinly scattered over a more extensive area.
- There are two approaches of biodiversity conservation:

  (a) *In situ* conservation (within habitat): This is achieved by protection of wild flora and fauna in nature itself, e.g. Biosphere Reserves, National Parks, Sanctuaries, Reserve Forests etc.

  (b) ***Ex situ* conservation (outside habitats):** This is done by establishment of gene banks, seed banks, zoos, botanical gardens, collections etc.

- Environmental pollution can be defined as any undesirable change in the physical, chemical or biological characteristics of any component of the environment (air, water, soil), which can cause harmful effects on various forms of life or property.
- Dissolved oxygen (DO) is the amount of oxygen dissolved in a given quantity of water at a particular temperature and atmospheric pressure.
- Biological oxygen demand (BOD) is defined as the amount of DO required to aerobically decompose biodegradable organic matter of a given volume of water over a period of 5 days at 20°C. More BOD values of any water sample are associated with poor water quality.
- In 1953, people in Japan suffered from numbness of body parts, vision and hearing problems and abnormal mental behavior. This disease called **Minamata disease** occurred due to consumption of **methyl mercury** contaminated fish caught from Minamata bay in Japan.
  Pollution by another heavy metal **cadmium** had caused the disease called **Itai-itai** in the people of Japan. The disease was caused by cadmium contaminated rice.
- Nitrate when present in excess in drinking water causes **blue baby syndrome** or **methaemoglobinemia.**
- Excess of fluoride in drinking water causes defects in teeth and bones called **fluorosis**.
- Solid waste materials that can be degraded by micro-organisms are called **biodegradable wastes**.
- Wastes that cannot be degraded by micro-organisms are called **non-biodegradable wastes**.
- **The Bhopal Gas Tragedy:** The world's worst industrial accident occurred in Bhopal, M.P., India on the night of 2nd and morning of 3rd December, 1984. It happened at Union Carbide Company which used to manufacture Carbaryl (Carbamate) pesticide using Methyl isocyanate (MIC).

- **Chernobyl Nuclear Disaster**: Chernobyl nuclear accident is the worst nuclear disaster in the history of human civilization which occurred at Chernobyl, Ukraine in the erstwhile USSR (now CIS). On 26 April, 1986 the accident occurred at the reactor of the Chernobyl power plant designed to produce 1000 MW electrical energy.

- The point on a fault at which the first movement occurs during an earthquake is called the epicenter.

- The severity of an earthquake is generally measured by its magnitude on Richter Scale.

- Tsunamis are the earthquake-generated water waves.

- **The 2004 Asian Tsunami**: The **Indian Ocean earthquake**, which occurred on December 26,2004, is one of the deadliest disasters in modem history known as the **Asian Tsunami**, and also the **Boxing Day Tsunami** as it took place on Boxing Day.

- Sustainable development is defined as "meeting the needs of the present without compromising the ability of future generations to meet their own needs." This definition was given by the Norwegian Prime Minister, G.H. Brundtland, who was also the Director of World Health Organisation (WHO).

- Rainwater harvesting is a technique of increasing the recharge of groundwater by capturing and storing rainwater. This is done by constructing special water-harvesting structures like dug wells, percolation pits, lagoons, check dams etc.

- The land area drained by a river is known as the river basin.

- The watershed is defined as the land area from which water drains under gravity to a common drainage channel. Thus, watershed is a delineated area with a well-defined topographic boundary and one water outlet.

- Troposphere, the lowermost layer of the atmosphere, traps heat by a natural process due to the presence of certain gases. This effect is called **Greenhouse Effect** as it is similar to the warming effect observed in the horticultural greenhouse made of glass. The amount of heat trapped in the atmosphere depends mostly on the concentrations of "heat trapping" or "greenhouse" gases and the length of time they stay in the atmosphere. The major greenhouse gases are carbon dioxide (CO_2), ozone, methane (CH_4), nitrous oxide (N_2O), chlorofluorocarbons (CFCs) and water vapours.
- Ozone layer filters out harmful ultraviolet radiations from the sunlight and thus protects various life forms on the earth.
- Ozone is a form of oxygen. The molecule of oxygen contains two atoms whereas that of ozone contains three (O_3). In the stratosphere ozone is continuously being created by the absorption of short wave-length ultraviolet (UV) radiations.
- The amount of atmospheric ozone is measured by 'Dobson Spectrometer' and is expressed in **Dobson units (DU)**.
- AIDS, the Acquired Immuno Deficiency Syndrome, is not a hereditary disease but is caused by HIV (Human Immunodeficiency Virus).
- On 5th June, 1972, environment was first discussed as an item of international agenda in the **U.N. Conference on Human Environment** in Stockholm and thereafter **5th June** is celebrated all over the world as **World Environment Day**.
- In India, the Wildlife (Protection) Act was passed in 1972, followed by the Water (Prevention and Control of Pollution) Act 1974, the Forest (Conservation) Act, 1980, Air (Prevention and Control of Pollution) Act, 1981 and subsequently **the Environment (Protection) Act, 1986**.
- According to World Health Organisation (WHO) health is "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity".