

INTRODUCTION TO ENVIRONMENTAL CHEMISTRY



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Module I

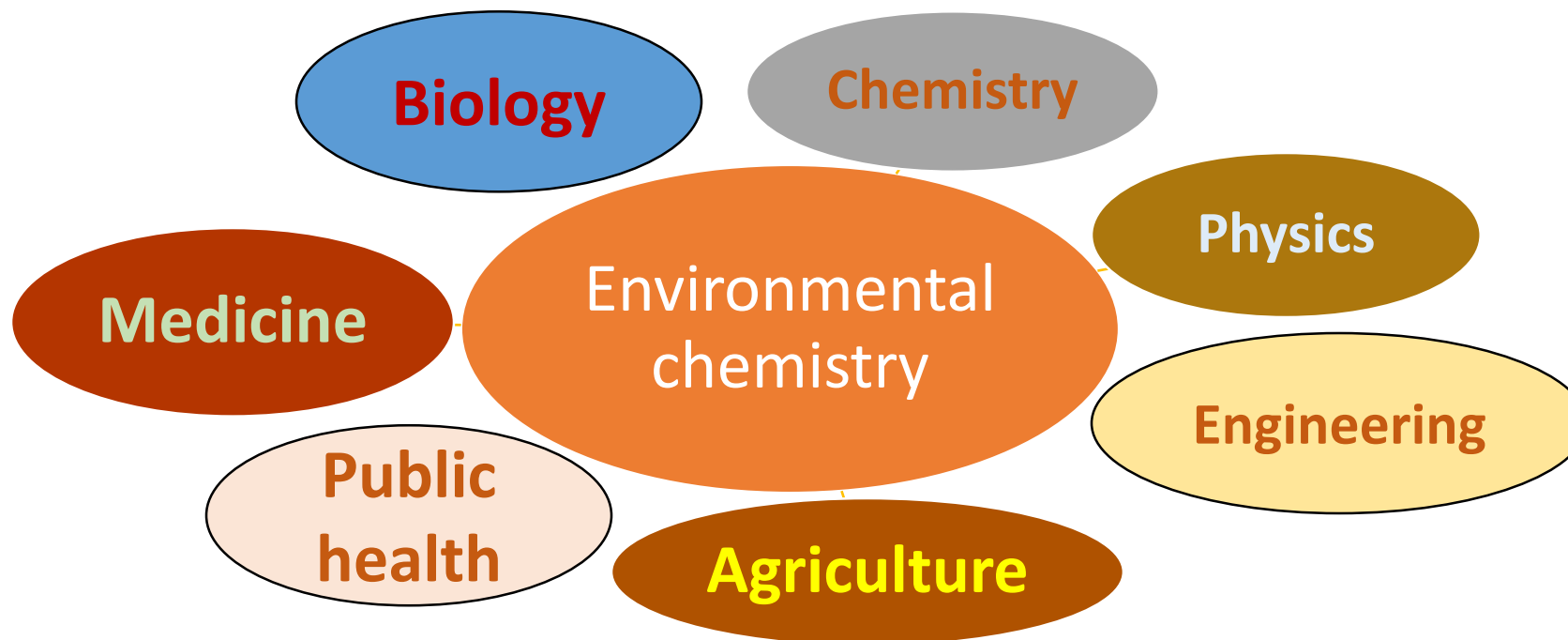
- Concept and scope of environmental chemistry – Segments of environment
- Environmental pollution: Concepts and definition – Pollutant, contaminant, receptor and sink
- Classification of pollutants - Global, regional, local, persistent and non-persistent pollutants



Environmental chemistry



multidisciplinary science



Environmental chemistry



- **Environmental chemistry** is the scientific study of the **chemical** and biochemical phenomena that occur in natural places.
- Source, Reactions, Transport, Effect & fate of chemical species in environment
- Effect of human activity
- Effects on humans



World Environment Day (WED)

- 5 June
- First held in 1974
- Air Pollution - theme for 2019



Earth Day

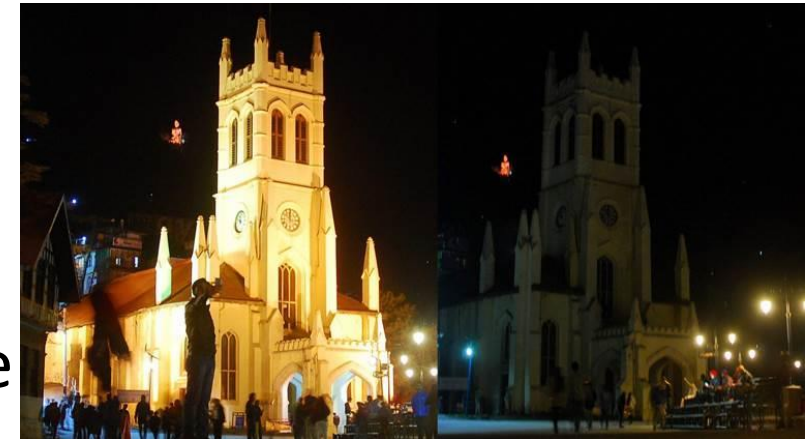
- April 22.
- First celebrated in 1970 in America.
- Support for environmental_protection
- Founder - US senator Gaylord Nelson -1969 - oil spill
- On Earth Day 2016, Paris Agreement signed by the US, China, 120 other countries.
- Earth Day 2019 -**Protect Our Species**





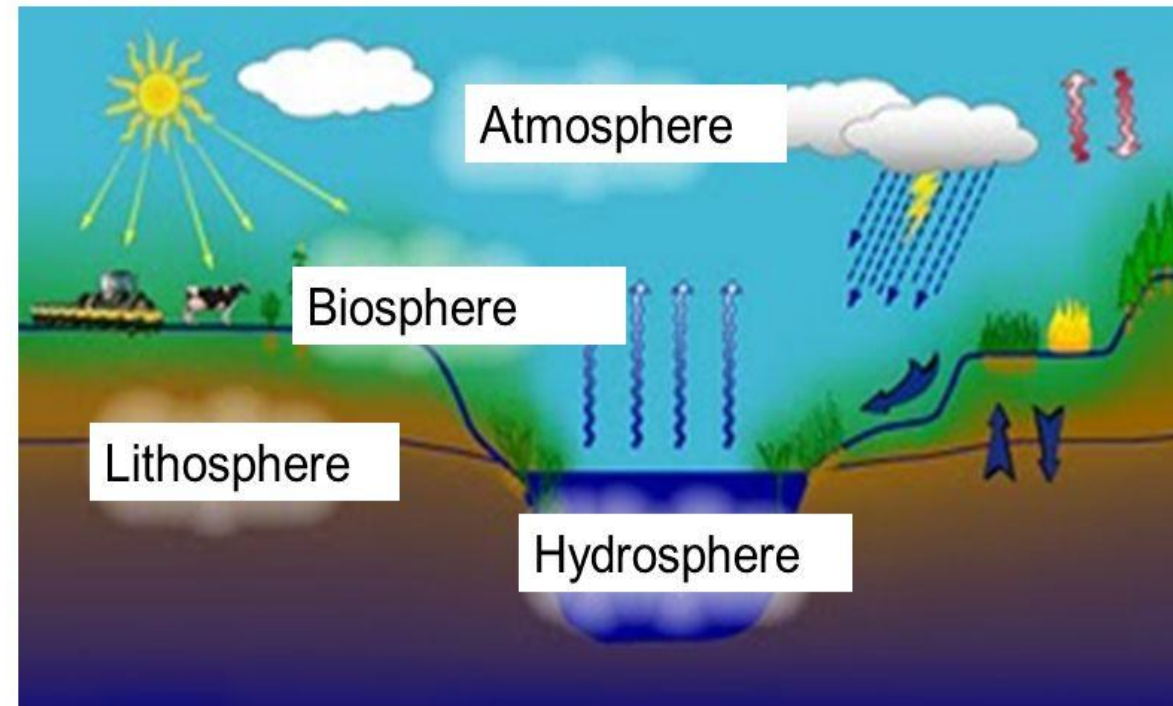
Earth Hour

- Organizer - World Wide Fund for Nature
- held annually - turn off non-essential electric lights for one hour, from 8:30 to 9:30 p.m. on a specific day towards the end of March
- Started in Sydney, Australia, in 2007
- Enlighten public
- Protection & conservation of environment
- Restrain the release of pollutants to atmosphere



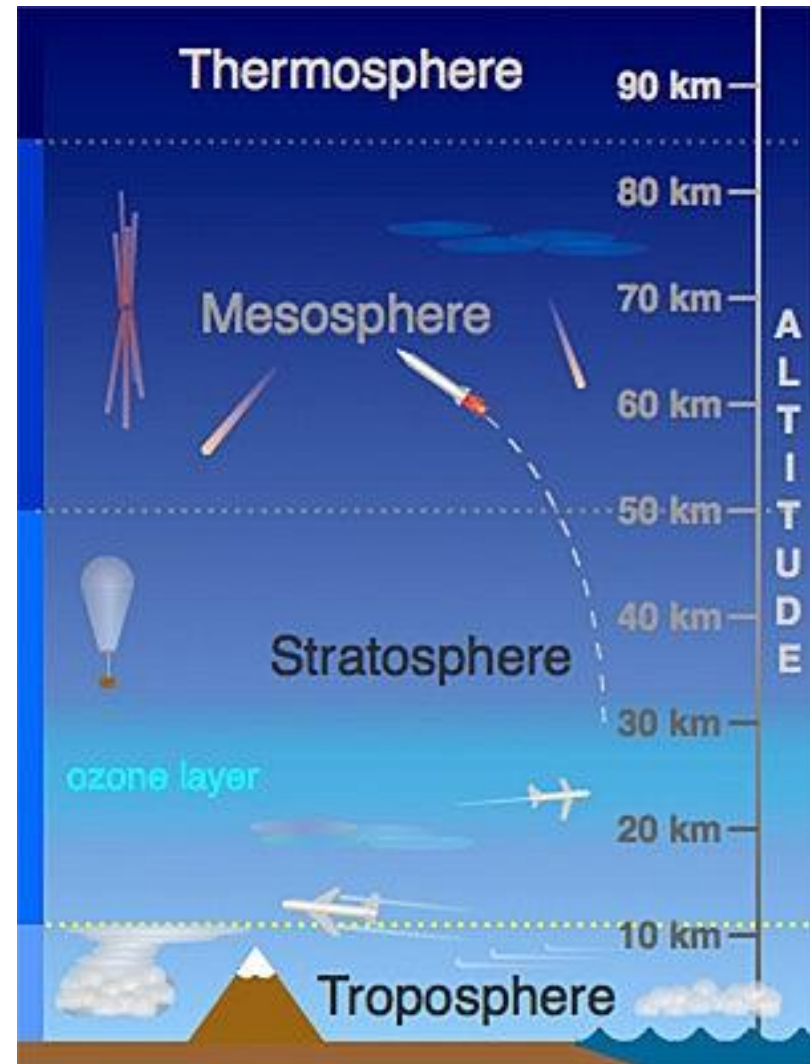
Environmental Segments

- Lithosphere
- Biosphere
- Hydrosphere
- Atmosphere



Atmosphere

- Layer of gases - air -surrounds earth
- Retained by earth's gravity
- Major component – N₂, O₂
- Minor components – ar, CO₂, H₂O





Atmosphere

- Protects life –absorbs harmful solar radiation - ultra violet rays (10 - 400nm)
- Warming the surface through heat retention (greenhouse effect)
- Reducing temperature extremes between day and night (the diurnal temperature variation)
- Source of O₂, CO₂, moisture

Hydrosphere



- Ocean, Sea, river, lake, stream, glaciers, polar ice caps, Ground water





Hydrosphere

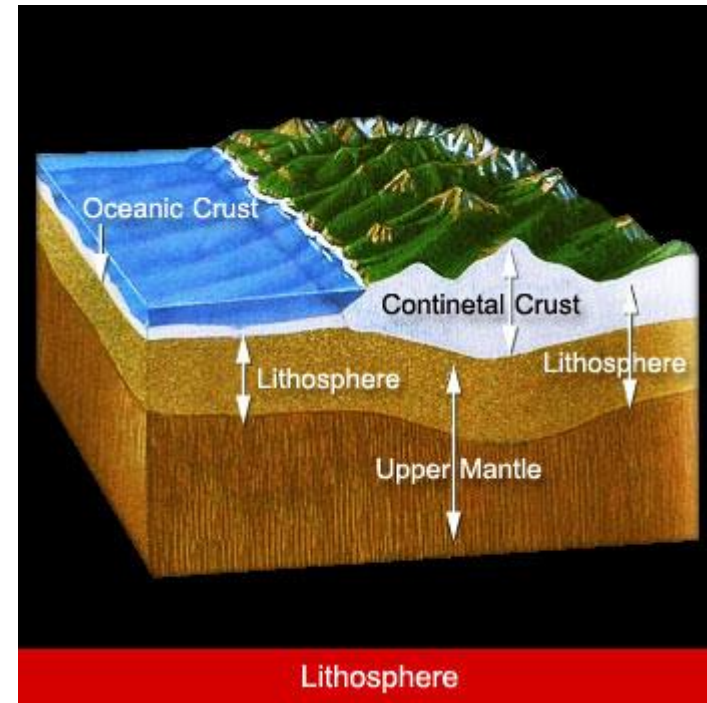
- Ocean– 97% of water
- Polar ice caps & glaciers– 2%
- Fresh water – 1%
- – river, lake, stream, ground water
- – used for human consumption
 - Irrigation -30%
 - Thermal power plant - 50%
 - Industries – 12%
 - Domestic- 7%





Lithosphere

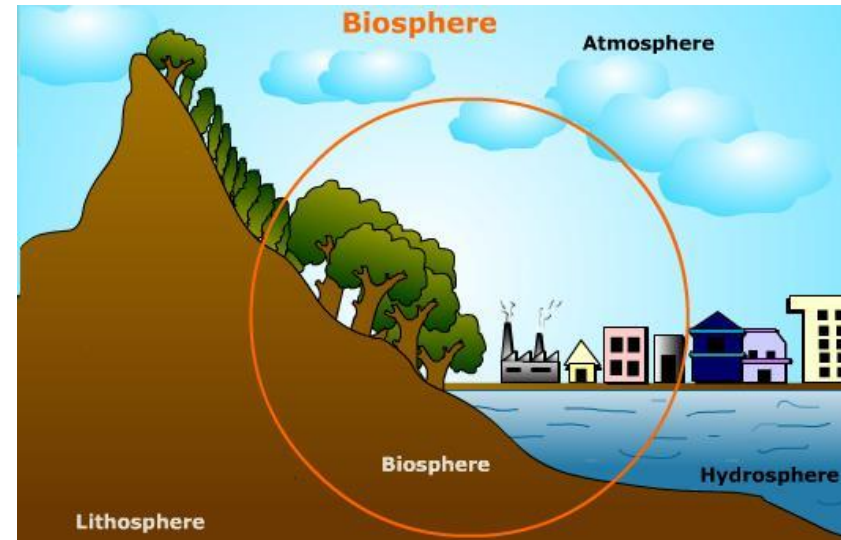
- Outer mantle of solid earth
- Mineral occurring in earth crust & soil
- Soil -most important component





Biosphere

- Realm of living organism & their interaction with environment
- Biological world intimately linked with energy flow in environment & water chemistry





Environmental pollution

- Undesirable change in physical chemical or biological characteristic of air, water or land that may be harmful to human or other life forms, cultural assets or cause wastage of our resources





Pollution

- pollution is the human introduction of chemicals, particulate matter, or biological materials that cause harm or discomfort to humans or other living things





Pollutant

- If the concentration of a substance already present in nature or a new substance increases to undesirable proportion by human action so that it spoils the environment and lowers the quality of life or effects health
- CO, SO₂, NO₂, Dust, Pollen etc.
- Compounds of metals like Zn, Hg, Cd, As etc.



Contaminant

- A substance that does not occur in nature but is introduced in significant amount into the environment by human action
- Reduces quality of life & affects our health
- **M**ethyl **i**so**c**ynate CH_3NCO – Bhopal Gas tragedy – union carbide

Receptor



- Element or organism affected by pollutant
- Human being –receptor for smog
- Wild animals & Birds – receptor for plastic





Sink

- Elements or surrounding that interacts or consumes a long lived pollutant
- Marble deposit act as sink for CO₂



- Oceans- Atmospheric CO₂
- Ground water & Sub Soil – Pesticides etc.






Categories of pollution

- Air pollution
- Water pollution
- Soil pollution



Global, regional & local, pollutants



Extent of pollution	
	<ul style="list-style-type: none">• Local scale• Only affect a certain area• Air, water, land, noise
	<ul style="list-style-type: none">• Regional scale• Spread over countries• Air and water
	<ul style="list-style-type: none">• Global scale• Spread over continents• Global warming/ Ozone depletion



Global, regional & local, pollutants

- The damage caused by a **local pollutant** is experienced near the source - Eg:-Non-biodegradable plastics
- The damage caused by a **regional pollutant** is experienced at greater distances from the source. – SO_2 from coal emissions is believed to be a culprit in the acid rain problem



Global, regional & local, pollutants

- Local pollutants cause damage near the emission source. Regional pollutants cause damage further from the emission source
- When pollution affects within a country, it's local, when it affects two or more countries (trans-boundary) it's regional, and when across continents, it's global



Global, regional & local, pollutants

- A **global pollutant** refers to a pollutant whose damage is determined by its concentration in the upper atmosphere
- CO₂ is often cited as a contributor to the greenhouse effect
- Chloroflourocarbon emissions are linked to ozone depletion



Pollutants

Non-persistent

- A substance that can cause damage to organisms when added in excessive amounts to the environment but is decomposed or degraded by natural biological communities and removed from the environment relatively quickly

Persistent

- They are compounds that are resistant to environmental degradations through various processes....



Pollutants

Non-persistent

- Domestic sewage
- Discarded vegetables
- Faecal matter, blood, urine etc.
- Non persistent pollutant may be biodegradable

Persistent

- Remain in the environment for many years in an unchanged condition
- Takes decades or more to degrade
- May be toxic
- DDT, Plastic, Pb, Hg, radioactive waste etc.
- Damages are often irreversible



Persistent Pollutant

Persistent organic pollutants (POPs) are organic compounds that,

- Resist photolytic, biological and chemical degradation.
- POPs are often halogenated and characterized by low water solubility and high lipid solubility, leading to their bioaccumulation in fatty tissues.
- They are also semi-volatile, enabling them to move long distances in the atmosphere before deposition occurs.



Reference

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Thank you