A **biogeochemical cycle**

A biogeochemical cycle or (Nutrient cycle) is a circulating or repeatable pathway by which either a chemical element or a molecule moves through both biotic ("bio-") and abiotic ("geo-") components of an ecosystem, therefore these elements are always in circulation moving from non-living to living and then back to the non-living components of the ecosystem in a more or less circular fashion. The biogeochemical cycles concerns with the cycling of chemicals that are absorbed or ingested by organism and then passed through the food web. They ultimately end up to the air, water and soil through various metabolic activities.

Of the 90- elements known to occur in nature, some 30 or 40 are thought to be required by living organisms. The principal elements of life are **carbon**, **hydrogen**, **oxygen**, and **nitrogen**. However, a number of others are certainly important to understand as well, notably **phosphorus** and **sulfur**. Some "non-essential" elements participate in biogeochemical cycles, entering organism tissues because of chemical similarity to essential elements. For example, strontium can behave like calcium in the body.

Based on the nature of the reservoirs, there are two types of cycles:-

**1- Gaseous Cycle**: where the reservoir is the atmosphere or the hydrosphere such as water cycle, carbon cycle, nitrogen cycle, etc. Gaseous cycle move rapidly and adjust more readily to the changes in the biosphere because of the large atmospheric reservoir. For example, accumulations of carbon dioxide are scattered by winds or are absorbed by plants.  Any unusual or frequent disturbances affect the capacity for self-adjustment.

**2- Sedimentary Cycle**: where the reservoir is the earth’s crust such as elements mostly found in earth’s crust, phosphorous cycle, sulphur cycle, calcium cycle, magnesium cycle etc. Sedimentary cycle varies from one element to the other, each cycle consists of a solution and a rock or sediment phase. Weathering of rocks releases minerals in the form of salts which dissolve in water and can pass through a series of organisms and can reach deep sea where they settle out of circulation indefinitely. Other salts settle as deposit as sediment and rock in shallow seas.

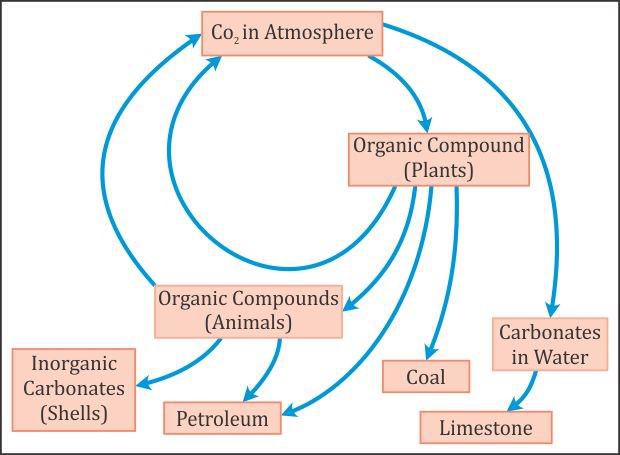
Based on the replacement period, a nutrient cycle is referred to:-

1. A perfect nutrient cycle is one in which nutrients are replaced as fast as they are utilized. Most gaseous cycles are considered as perfect cycles.
2. Imperfect nutrient cycle such sedimentary cycles are considered relatively imperfect, as some nutrients are lost from the cycle and get locked into sediments and so become unavailable for immediate cycling.

**Carbon Cycle**

Carbon is required for the building of all organic compounds. Carbon in the form of carbon dioxide (CO2) is obtained from the atmosphere and transformed into a usable organic form by organisms. Carbon dioxide exists in atmosphere as a free gas, fossil organic deposits (such as oil and coal), and durable organic materials like cellulose, in addition mineral carbonates, such as limestone. During the process of carbon fixation, carbon dioxide is taken up from the atmospheric reservoir (or from biocarbonates dissolved in water) by plants, photosynthetic bacteria, and algae and is "fixed" into organic substances. Animals obtain their requirements for carbon by eating plants or other animals. For the biological links, the carbon cycle comes full cycle when carbon is released by either plants and animals as they respire or after life as they decompose. The burning of organic material such as wood or fuels also results in the release of carbon dioxide from organic carbon.

CO2 is a trace gas and has huge effects on Earth’s heat balance by absorbing infrared radiation. During the growing season or summer, there is a decrease in atmospheric CO2 because increased sunlight and temperature helps plants increase their carbon dioxide uptake and growth. In the winter time, more CO2 enters the atmosphere than can be removed by plants. This happens because plant respirations and the death of plants happens faster than photosynthesis.



**Nitrogen Cycle**

Nitrogen is required for the manufacturing of all amino acids and nucleic acids; however, the organism can not use atmospheric nitrogen for these tasks and as a result is dependent on the nitrogen cycle as a source for its usable nitrogen. The nitrogen cycle begins with nitrogen stored in the atmosphere as N2 or nitrogen stored in the soil as ammonium (NH4+), ammonia (NH3), nitrite (NO2−), or nitrate (NO3−). Nitrogen is assimilated into living organisms through three stages: nitrogen fixation, nitrification, and plant metabolism.

1- Nitrogen fixation is a process which occurs in prokaryotes in which N2 is converted to (NH4+). Atmospheric nitrogen can also undergo nitrogen fixation by lighting and UV radiation and become NO3-. Following nitrogen fixation, nitrification occurs.

2- During nitrification, ammonia is converted into nitrite, and nitrite is converted into nitrate. Nitrification occurs in various bacteria. In the final stage, plants absorb ammonia and nitrate and incorporate it into their metabolic pathways.

3- Once the nitrogen has entered the plant metabolic pathway, it may be transferred to animals when the plant is eaten. Nitrogen is released back into the cycle when denitrifying bacteria convert NO3- into N2 in the process of denitrification, when detrivorous bacteria convert organic compounds back into ammonia in the process of ammonification, or when animals excrete ammonia, urea, or uric acid.

A lot of environmental problems are caused by the disruption of the nitrogen cycle by human activity some of the problems caused are the production of troposperic smog, the perturbation of stratospheric ozone, contamination of ground water, and the formation of greenhouse gas.

