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THE CARBON CYCLE IN THE COURSE OF STUDY RELATED TO THE BIOLOGICAL SCIENCE AT VARIOUS LEVEL

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ABSTRACT:

Chief available sources of carbon is the Carbon-dioxide of the atmosphere which is also dissolved in the water of all type resources fresh water as well as marine water, it is only the green plants that can make use of carbon dioxide in photosynthesis for producing food. The decomposers, i.e. bacteria and fungi etc. also help returning carbon-dioxide (CO2) into the atmosphere and water in the soil by acting chemically upon the remains of dead animals and plants and their wastes, such as urine and faeces. The carbon / carbon dioxide cycle shows the interdependency among organisms, and natural environment. This is also essential knowledge for every body studying the biology at various levels.

KEYWORDS:

CARBON CYCLE, SOURCES, SINKS, SEQUESTRATION, AND REGULATION.

INTRODUCTION:

Carbon cycle is the biogeochemical cycle by which carbon is exchanged among the biosphere, pedosphere, geosphere, hydrosphere and atmosphere of the earth - carbon is the main component of biological compounds as well as a major component of many minerals such as limestone. The carbon cycle comprises a sequence of events that are key to make earth capable of sustaining life. It describes the movement of carbon as it recycled and reused throughout the biosphere, as well as long-term processes of carbon sequent-ration to and release from carbon sinks. Carbon sinks in the land and the ocean each currently take up about one-quarter of anthrop genetic carbon emissions each year.

Tiny atoms of carbon are able to move around the earth through carbon cycle. The element carbon is a part of seawater, the atmosphere, rocks such as limestone and coal, soils as we all living things. Chief available source of carbon is the carbon dioxide of the atmosphere which is also dissolved in the water of ponds, lakes and ocean etc. It is only the green plants that can make use of carbon dioxide in photosynthesis for producing food. Oxygen is set free at the same time. It is used by nearly all living things for respiration - a process in which energy - rich food is broken down, and its energy is released for work. In doing so carbon dioxide is set free for the use of produced again. As compared to oxygen, the biological cycling of carbon is somewhat more direct, only two main components viz., carbon-dioxide and organic carbon compounds, are involved in the carbon cycle, even though carbon occurs in several inorganic pools. Carbon exchange across water - air interfaces is a fairly slow process and this is why the carbon cycle occurs more or less interpedently in aquatic and terrestrial ecosystems. In order for the carbon cycle to function, there are numerous sources and sinks of carbon which absorb and release carbon at different rates and helps regulate Carbon concentration around the globe.

CARBON SOURCES: Carbon sources are any natural or artificial production site of carbon and / or any Chemical compounds composed of carbon, such as carbon dioxide and methane. The burning of fossil fuels, forest fires, animal respiration, and plant degradation are all sources of carbon.

CARBON SINKS: Carbon sinks are natural or artificial reservoirs that absorb and store carbon through the process of carbon sequestration. Just as carbon sources are worldwide, so are carbon sinks and understanding how they work and how they are changing is important in predicting the impacts of climate change e.g. plants, plankton, and the ocean.

CARBON SEQUESTRATION: It is the process by which carbon dioxide is captured and stored. This term is commonly associated with the capture and storage of atmospheric carbon-dioxide. These are three types.

(i) Biological refers to the storage of atmospheric carbon in vegetation, soil, wood, and aquatic ecosystem

(ii) Geological refers to the process by which carbon and Carbon-dioxide are stored in geological formations. This process as fundamental for the formation of fossil fuels and is used as a part of enhanced oil recovery.

(iii) Technological refers to the artificial processes in which carbon and carbon dioxide are trapped and stored.

IMPACT OF HUMAN ACTIVITIES ON CARBON CYCLE

(i) Burning fossil fuels like coal and wood add large amounts of carbon-dioxide to the atmosphere.

(ii) We clear trees and other plants (vegetation) that absorb Carbon dioxide faster than they can regenerate themselves.

(iii) The above two activities increase the earth's average temperature by adding excess carbon-dioxide to atmosphere.

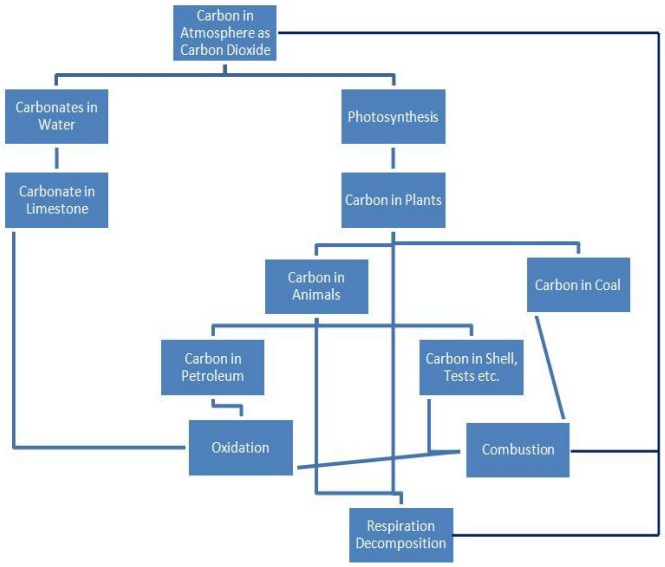
The increased concentrations of atmosphere carbon-dioxide and other green hoses gases could enhance the planet's natural green house effect which hell warm the lower atmosphere and the earth's surface. The resulting warming could disrupt global food production and wild life habitats, alter temperature and precipitation pattern and raise the average sea level in different parts of the world.

REGULATION OF CARBON CYCLE

In global ecosystem Carbon occurs as carbon dioxide in the atmosphere as organic compounds in plants and animal bodies, in coal and petroleum deposits and as inorganic carbonates in water, rocks, shells and testes etc, Photosynthesis brings carbon of the atmosphere into the biotic pool while respiration and decomposition of organic matter adds most of this element to the atmosphere. A part of carbon of biotic reservoir may be fixed in cool, petroleum and carbonate deposits which constitute the biological output of carbon cycle. Some carbon dioxide may dissolve into water from the atmosphere and enter the hydrosphere while inorganic carbonates in aquatic system may be precipitated and turned into lime stone.

Carbon-dioxide is the major state in which carbon is involved in biological or trophic level cycling. Between 4 to 9 x 10^{13} kg of carbon are used annually on autotrophic photosynthesis. For some organisms in the vicinity of hydro carbon Seeps on the ocean floor, notably mussels, clams, and tube warms, methane is the carbon source and is assimilated by the collaboration of symbiotic methane bacteria.

Respiratory activity in the producers and consumers accounts for the return to of a considerable amount of the biologically fixed carbon a gaseous carbon-dioxide to the atmosphere. The most substantial return, however, is accomplished by the respiratory activity of decomposers in their processing of the waste materials and dead remains of other trophic levels. Additional return from the biota occurs through the non-biological process of combustion, both through the purposive use of wood in a five place and accidental fire in a forest or building. Such combustion can and does involve consumers and decomposers as well as producers. Sedimentary carbon includes such animal remains as protozoan tests, coral, mollusc shells, and echinoderm and vertebrate skeletal materials, as well as carbonate crocks, In addition, a number of aquatic plants occurring in alkaline waters release calcium carbonate as a by product of photosynthetic assimilation. This pure calcium carbonate precipitate mixed with clay to term Mari, which over a long period of time can be compacted as limestone, on weather ring and dissolution of carbonate rocks, the combustion of the fossil fuels (peats, coal oil), & volcanic activity involving deposits of both fossil fuel and carbonate rocks, the bound carbon is returned to the atmospheric - aquatic reservoirs.



The carbon dioxide used in photosynthesis is obtained almost entirely from the atmosphere, where its concentration varies little around 300 ppm, increasing by 0.4-0.5% per annum. In a terrestrial ecosystem the flux of carbon dioxide at night is upwards from the soil and vegetation to the atmosphere, on sunny days above a photosynthesizing canopy there is a down word flux. Carbon dioxide diffuses freely in air and its depletion is likely to affect members of it plant population evenly - there is no obvious way in which neighbouring plants can easily be seen to gain an advantage, one over another by capturing what is a rather freely available resources.

During the last 150 years, atmospheric carbon dioxide has increased to more than 370 ppm. This increase has led to concern regarding the green house effect is the warming of the climate of earth attributed to the increased concentration of carbon dioxide and certain other gaseous pollutants in the atmosphere. These greenhouse gases (methane, ozone, nitrous oxide and chloro fluorocarbons) absorb infrared radiation emitted by the solar - heated earth and reflect most of that heat energy back to earth, resulting in potential global warming. The rapid oxidation of humans and release of the gaseous carbon-dioxide normally held in the soil has other, more subtle effect including effects on the cycling of other nutrients.

The flux between the reservoir pool and the exchangeable pool of many elements is being fundamentally altered by the present mis- management of the landscape. There are practices that humans can use to compensate. If humans recognize what has happened and learn to compensate, such changes need not be determined.

The production of carbonates in the sea also forms carbon dioxide as by products as follows:

$$Ca + 2HCO_3 \rightarrow CaCO_3 + H_2O + CO_2\uparrow$$

(Calcium)(Bicarbonate) (Calcium Carbonate) (Water) (Carbondioxide)

Because of the reduction in pH that results from moving this reaction to the right, only 0.6 moles of carbonate are actually released into seawater, coral reefs and other calcifying organisms are a source, not a sink, of carbon dioxide. The sea plays a major role in the sequestering of carbon. The sea contains 40 atmospheres of carbon as bicarbonate and dissolved organic carbon which function as major carbon reservoirs. The sea is, therefore, a very effective buffer of atmospheric carbon dioxide, because the sea and the atmosphere are equilibrating with one another. This is likely the primary control mechanisms for atmospheric carbon dioxide. Any large future increase in the burning of fossil fuels, coupled with future decreases in the carbon dioxide removal capacity of the green belt is almost certain to result in a continued risen the carbon dioxide content of the atmosphere In addition to carbon dioxide, two other forms of carbon are present in the atmosphere in small amounts: carbon monoxide at about 0.01 ppm, and methane at about 1.6 ppm. Both carbon monoxide (CO) and methane (CH_4) arise from the incomplete on anaerobic decomposition of organic matter in the atmosphere; both are oxidized to Carbon dioxide (CO_2).

CONCLUSION AND RECOMMENDATIONS

Carbon must be in the form of a gas carbon dioxide (CO_2) in order to be used by plants. Fixed as a solid in the soil or rocks of the earth, it is useless. It is taken by plants as a gas from the air or in solution from water, and transformed into organic compounds which serve as a source from which animals and dependent non-green plants get their carbon supply. It is being continually returned to the air as water as a gas carbon dioxide (CO_2) by metabolic processes of all living organisms. Carbon which is stored in the bodies of organisms at time of death may be stored in the soil and be unavailable for use unless released by fire or by the process of decay. Organic remains in the soil that are preserved from Saprophytic decay may be stored in the ground and form seat Legs bees bogs, cort beds, or petroleum. In water, the end product of carbon storage is limestone ($CaCO_3$) which forms large blocks in the crust of the earth.

Since the life sciences along with the physical sciences have received much more attention to revise and refresh course there is an urgent need now to lay emphasis on the protection of environment all over the world and thence to provide a better life to the living beings of this planet in order to maintain a proper balance between the environment and human survival it becomes imperative to incorporate concepts of immediate concern that have direct implications not only to theory but practical work and their subsequent application for environmental protection and human survival. This is also significant with the view point to bring out social awareness towards the protection of environment, human Survival and then to maintain the ecological balance.

Awareness for maintaining a proper balance between man, plants, animals, water oxygen, carbon dioxide, nitrogen and ozone layer so that the proper balance between the same may not be disturbed.

The study of such concept as Carbon cycle / Carbon dioxide cycle should be specifically introduced in the courses of study related to the biological sciences at various levels.

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