

SULPHUR CYCLE

Living organism requires constant supply of mineral elements for the sustenance of their life. These minerals are obtained initially from the inorganic sources. Thus, although the mineral cycles may vary from element to element, basically, all of them involves two phases in their cycle —

- (a) Soil Solution (b) Sedimentary Phase

This Sedimentary Phase of two types: —
Sulphur cycle and Phosphorus cycle.

Sulphur is a component of 3 amino acids (Cysteine, cystine and methionine), so is a component of most proteins, some vitamins and enzymes.

SOURCES :-

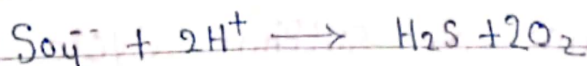
It is found in nature as element and also as sulphates in soil, water and rocks. So the reservoir pool of the elements is in the soil.

Utilization :- Producers need sulphur in the form of the sulphates SO_4^{2-} from soil or from water.

Steps :-

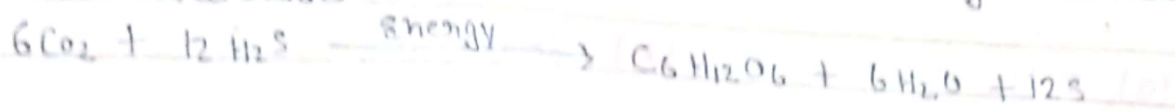
- (a) After the death of plants and animals, they are decomposed by microbes like *Aspergillus*, *Neurospora* and *Escherichia* releasing hydrogen sulphide (H_2S).

Aspergillus and *Neurospora* are aerobes while *Escherichia* operates in anaerobic conditions. Sulphate is also reduced under anaerobic conditions to elemental sulphur or to sulphides (including H_2S) by certain heterotrophic bacteria i.e., *Desulfavibrio*, *Escherichia* and *Acetobacter*.



The high concentration of H_2S in deeper parts of aquatic ecosystems e.g. below 200 metres in the Black Sea, does allow the survival of higher animals. Similarly fish is unable to survive.

67. A part of H_2S is oxidised to soluble sulphates by sulphur bacteria like Thiobacillus (white crystallization (colourless sulphur bacteria) oxidized about of H_2S to elemental sulphur. The oxidation of H_2S releases energy which is used in their chemosynthetic metabolism involving reduction of carbon dioxide.



The remaining passes into reservoir pool in deep sediments. From the sea, sulphur goes back to land in three ways i.e. food chains, sea sprays and geological upheavals.

- (C). Many industries release SO_2 into atmosphere. As the lichens are very sensitive to SO_2 , they disappear in polluted air containing SO_2 .
- (D). Fossil fuels on burning send SO_2 into the atmosphere.
- (E). Volcanic emissions also add sulphate to soil and air.

So, we found that, sulphur cycle, is an imperfect cycle as sulphur has the potential for being bound, under anaerobic condition to cations like calcium and iron to form highly insoluble ferrous sulphide (FeS), ferric sulphide (Fe_2S_3) and calcium sulphate ($CaSO_4$).

SO_2 is a major source of air pollution. Atmospheric sulphur in the form of elemental sulphur or H_2S or SO_2 is oxidised to SO_3 which combines with water to form sulphuric acid which comes on land as acid rain.

Significance of sulphur cycle :-

The sulphur cycle is an excellent example of interaction and regulation that exists between different mineral cycles.

It demonstrated the complex biological

and chemical, regulation with in such cycles. The sulphur cycle also exhibits the linkage between gaseous, hydro-logic and sedimentary cycles. It is also a good example to show the role played by micro-organisms. The sulphur cycle is affected by industrial air pollution as the burning of fossil fuels greatly increases the concentration of SO_2 in the atmosphere.

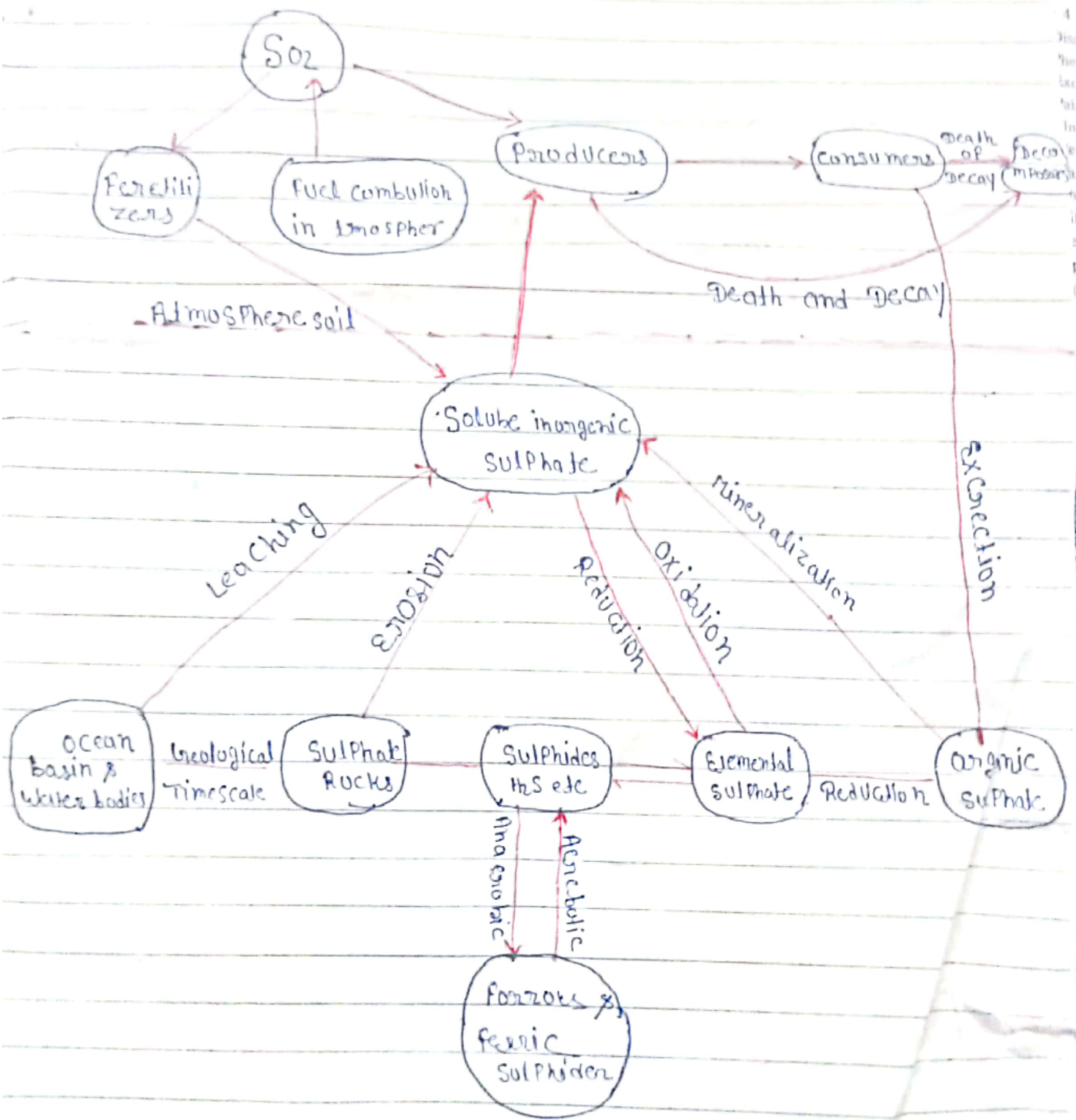


Fig: SULPHUR CYCLE