

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE



NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE:

NAME : SUDIPTA DAS
COLLEGE ROLL NO : MTUGC/053/19
DEPARTMENT : MATHEMATICS
YEAR : 2020
SIGNATURE : Sudipta Das.

TABLE of CONTENTS

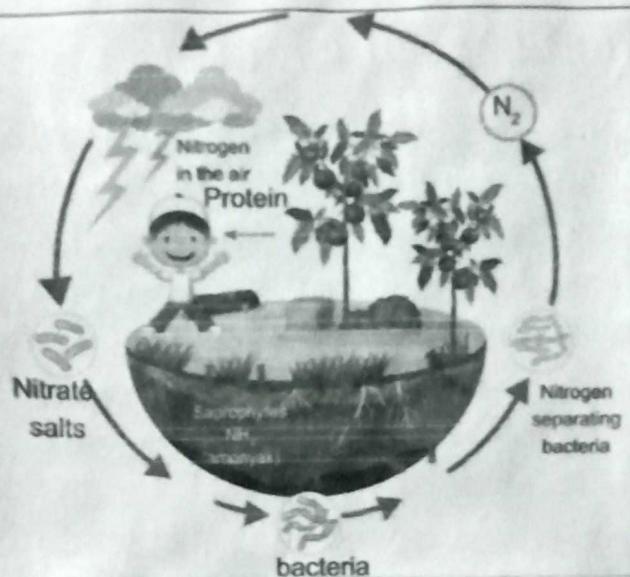
Topic	Page
What is nitrogen cycle?	01
Processes in nitrogen cycle	02 - 06
The global nitrogen cycle	07
Nitrogen cycle in marine eco.	08
Importance of nitrogen cycle	09
Conclusion	10
Acknowledgement	11
Certificate	12

■ WHAT IS NITROGEN CYCLE?

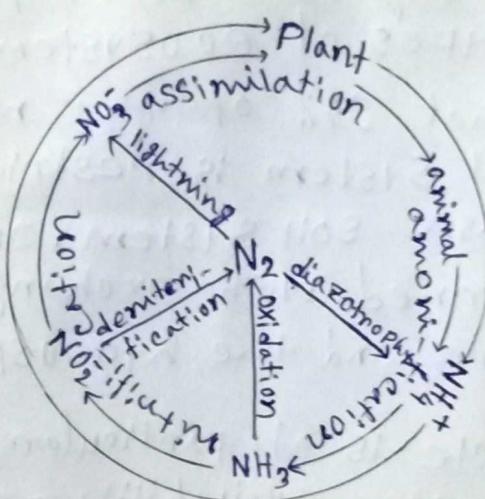
Nitrogen cycle is the biogeochemical cycle by which nitrogen is converted into multiple chemical forms as it circulates among atmosphere, terrestrial, and marine ecosystems. The conversion of nitrogen can be carried out through both biological and physical processes. Important processes ~~in the~~ in the nitrogen cycle include fixation, ammonification, nitrification, and denitrification. The majority of Earth's atmosphere (78%) is atmospheric nitrogen, making it the largest source of nitrogen. However, atmospheric nitrogen has limited availability for biological use, leading to a scarcity of usable nitrogen in many types of ecosystems.

It is shown that 95% of the nitrogen flow in the global terrestrial system is restricted to the Plant-microorganism-soil system. Only 5% of the total flow is concerned with exchanges to and from the atmosphere and the hydrosphere.

The nitrogen cycle is of particular interest to ecologists because nitrogen availability can affect the rate of key ecosystem processes, including primary and decomposition. Human activities such as fossil fuel combustion, use of artificial nitrogen fertilizers, and release of nitrogen in wastewater have dramatically altered the global nitrogen cycle. Human modification of the global nitrogen cycle can negatively affect the natural environment system and also human health.



* A Classical representation of the nitrogen cycle:-

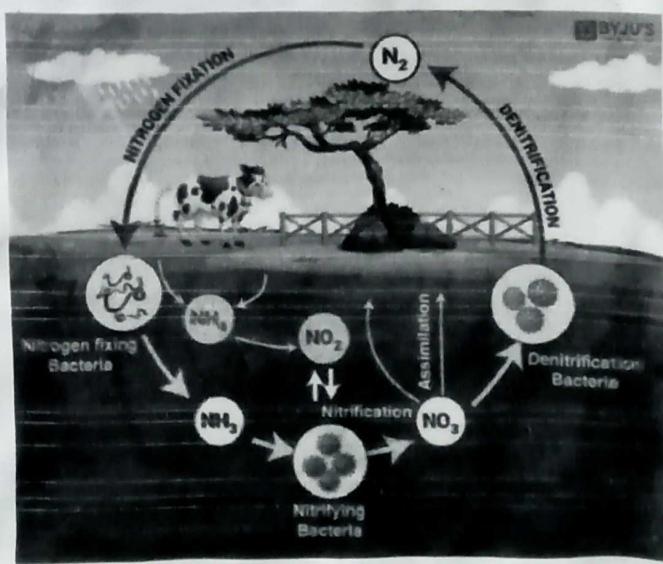


PROCESSES IN NITROGEN CYCLE

Nitrogen is present in the environment in a wide variety of chemical forms including organic nitrogen ammonium (NH_4^+), nitrite (NO_2^-), nitrate (NO_3^-), nitrous oxide (N_2O), nitric oxide (NO) or inorganic nitrogen gas (N_2). Organic nitrogen may be in the form of a living organism, humus or in the intermediate products of organic matter decomposition. The processes in the nitrogen cycle is to transform nitrogen from one form to another.

Nitrogen Fixation

The conversion of nitrogen gas (N_2) into nitrates and nitrite through atmospheric, industrial and biological processes is called nitrogen fixation. Between 5 and 10 billion kg per year are fixed by lightning & strikes, but most fixation is done by tree-living or ~~symbiotic~~ symbiotic bacteria known as diazotrophs. These bacteria have the nitrogenase enzyme that combines gaseous nitrogen with hydrogen to produce ~~ammonia~~ ammonia, which is converted by the bacteria into the organic compounds. An example of free-living bacteria is Azotobacter. Symbiotic nitrogen-fixing bacteria such as ~~Rizo~~ Rhizobium usually live in the root nodules of legumes (such as peas, alfalfa, and locust trees). Here they form a mutualistic relationship with the plant, producing ammonia in exchange for carbohydrates. Today, about 30% of total fixed nitrogen is produced industrially using the Haber-Bosch process, which uses high temperatures and pressures to convert nitrogen gas and a hydrogen source into ammonia.



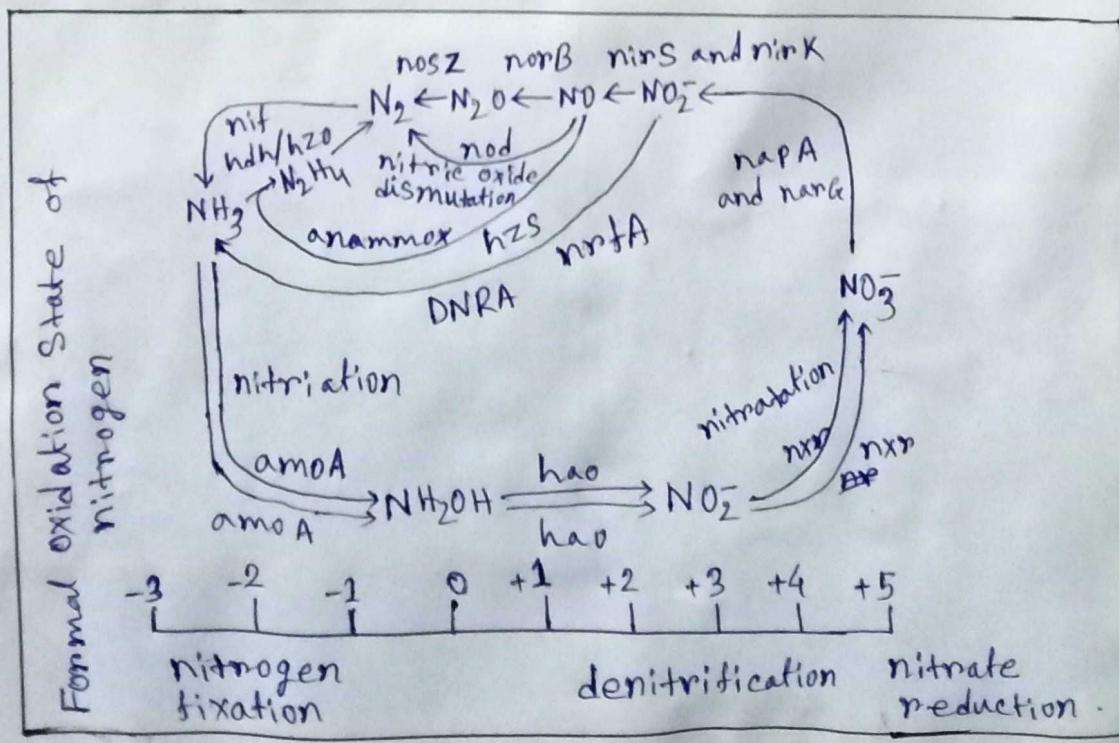
■ Assimilation

This process is the formation of organic nitrogen compounds like amino acids from inorganic nitrogen compounds present in the environment. Organisms like plants, fungi and certain bacteria that can't fix nitrogen gas (N_2) depend on the ability to assimilate nitrate or ammonia for their needs. Other organisms like animals depend entirely on organic nitrogen from their food.

■ Ammonification

When a plant or animal dies or an animal expels waste, the initial form of nitrogen is organic. Bacteria or fungi convert the organic nitrogen within the remains back into ammonium (NH_4^+), a process called ammonification or mineralization. Enzymes involved are:

- * GS: Gln Synthetase (cytosolic and plastid)
- * GOGAT: Gln-2-Oxoglutarate aminotransferase (Ferredoxin and NADH)
- * GDH: Glu Dehydrogenase: P_450 dependent
 - Minor Role in ammonium assimilation.
 - Important in amino acid catabolism.



■ Nitrification

The conversion of ammonium to nitrate is performed primarily by soil-living bacteria and other nitrifying bacteria. In the primary stage of nitrification, the oxidation of ammonium (NH_4^+) is performed by bacteria such as the *Nitrosomonas* species, which converts ammonia to nitrites (NO_2^-). Other bacterial species such as *Nitrobacter* are responsible for the oxidation of the ~~nitrites~~ (NO_2^-) into nitrates (NO_3^-). It is important for the ammonia (NH_3) to be converted into nitrates or nitrites because ammonia gas is toxic for plants.

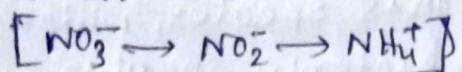
Due to their very high solubility and because soils are highly unable to retain anions, nitrates can enter groundwater. Elevated nitrate in groundwater is a concern for drinking water use because nitrate can interfere with blood-oxygen levels in infants and cause methemoglobinemia or blue-baby syndrome. Where groundwater recharges stream flow, nitrate-enriched groundwater can contribute to eutrophication, a process that leads to high algal population and growth, especially blue-green algal populations. While not directly toxic to fish like ammonia, nitrate can have indirect effects on fish if it contributes to this eutrophication.

■ Denitrification

Denitrification is the reduction of nitrates back into nitrogen gas (N_2), completing the ~~nito~~ nitrogen cycle. This process is performed by bacterial species such as *Pseudomonas* and *Paracoccus*, under anaerobic conditions. They use the nitrate as an electron acceptor in the place of oxygen during respiration. These facultatively anaerobic bacteria can also live in aerobic conditions. Denitrification happens in anaerobic conditions e.g. waterlogged soils. The denitrifying bacteria use nitrates in the soil to carry out respiration and consequently produce nitrogen gas, which is inert and unavailable to plants.

■ Dissimilatory nitrate reduction to ammonium

Dissimilatory nitrate reduction to ammonium (DNRA), or nitrate/nitrite ammonification, is an anaerobic respiration process. Microbes which undertake DNRA oxidise organic matter and use nitrate as an electron acceptor, reducing it to nitrite, then ammonium.

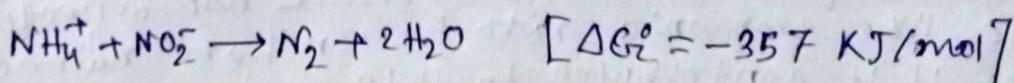


Both denitrifying and nitrate ammonification bacteria will be competing for nitrate in the environment, although DNRA acts to conserve bioavailable nitrogen as soluble ammonium rather than producing dinitrogen gas.

■ Anaerobic ammonia oxidation

In this biological process, nitrite and ammonia are converted directly into molecular nitrogen (N_2) gas. This process makes up a major proportion of nitrogen conversion in the oceans.

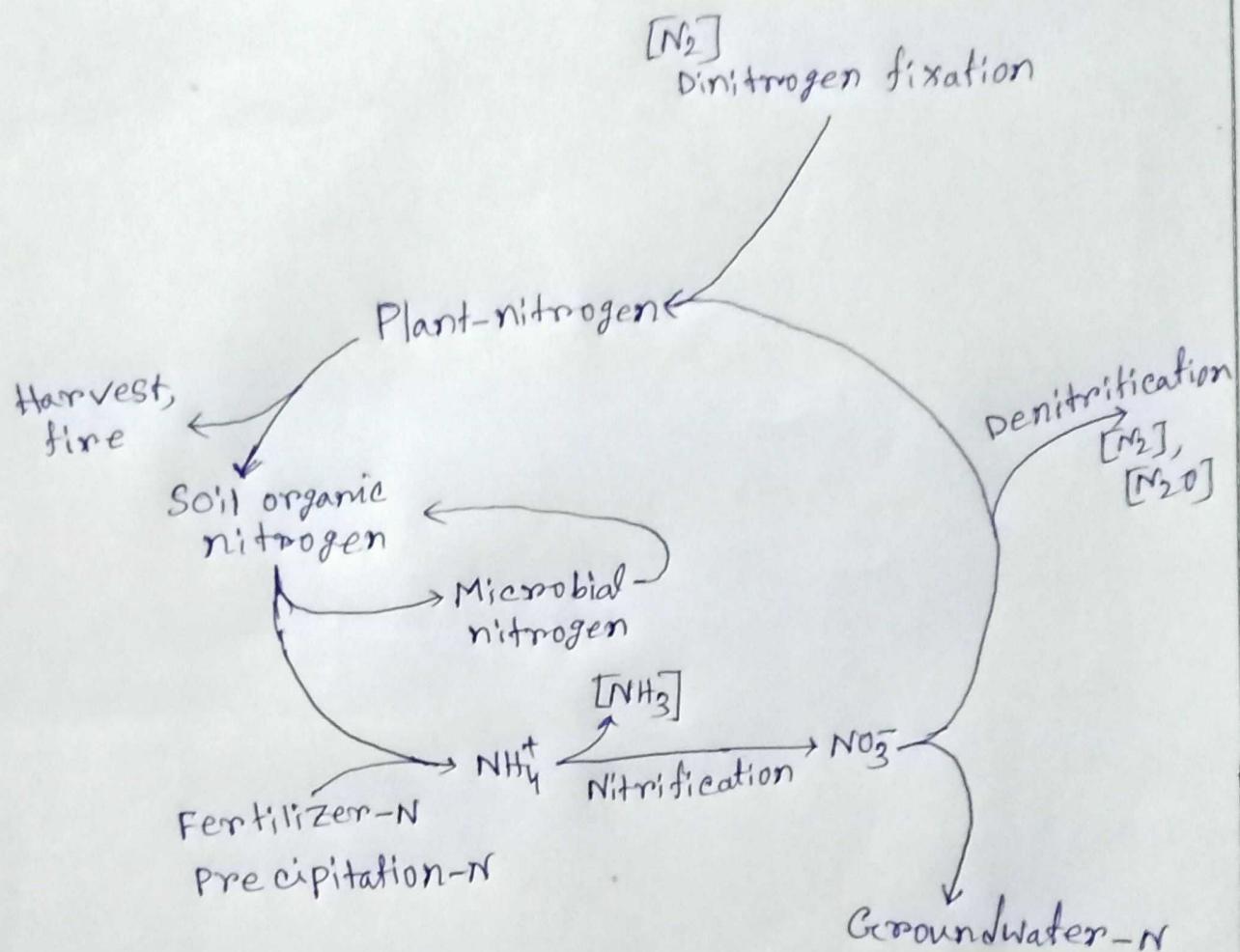
The balanced formula for this anammox chemical reaction is:



■ Other processes

Through nitrogen fixation is the primary source of plant-available nitrogen in most ecosystems, in areas with nitrogen-rich bedrock, the breakdown of this rock also serves as a nitrogen source. Nitrate reduction is also part of the iron cycle, under anoxic conditions Fe(II) can donate an electron to NO_3^- and is oxidized to Fe(III) while NO_3^- is reduced to NO_2^- , N_2O , N_2 and NH_4^+ depending on the conditions and microbial species involved.

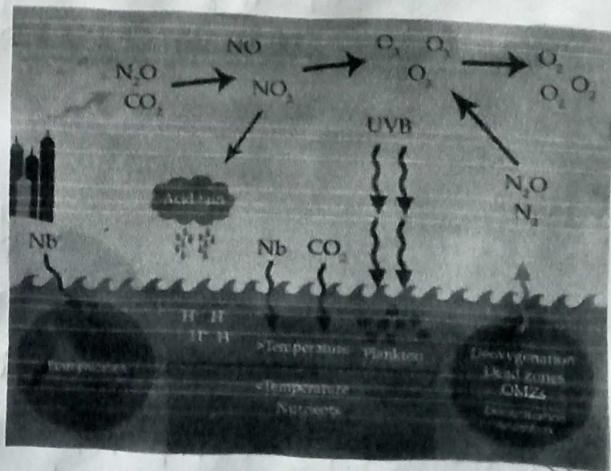
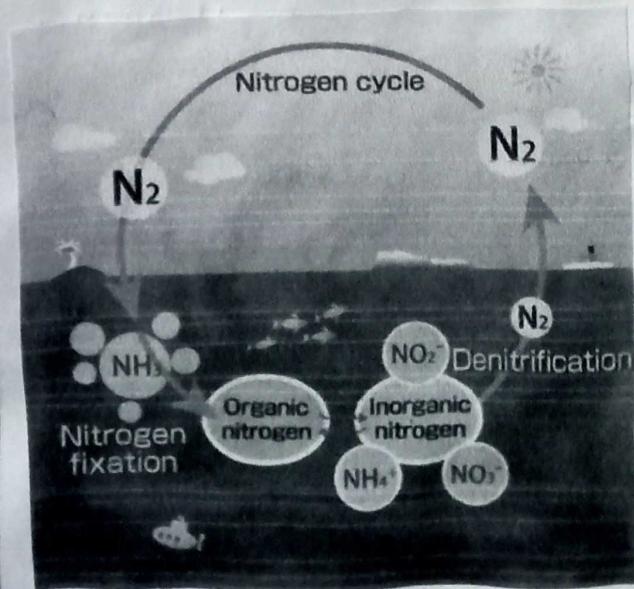
THE GLOBAL NITROGEN CYCLE



NITROGEN CYCLE IN MARINE ECOSYSTEM

The process of the nitrogen cycle occurs in the same manner in the marine ecosystem as in the terrestrial ecosystem. The only difference is that it is carried out by marine bacteria.

The nitrogen-containing compounds that fall into the ocean as sediments get compressed over long periods and form sedimentary rock. Due to the geological uplift, these sedimentary rocks move to land. Initially, it was not known that these nitrogen-containing sedimentary rocks are an essential source of nitrogen. But, recent researches have proved that the nitrogen from these rocks is released into the plants due to the weathering of rocks.



■ IMPORTANCE OF NITROGEN CYCLE

Importance of nitrogen cycle are as follows:

- 1) Helps plants to synthesise chlorophyll from the nitrogen compounds.
- 2) Helps in converting inert nitrogen gas into a usable form for the plants through the biochemical process.
- 3) In the process of ammonification, the bacteria help in decomposing the animal and plant matter, which indirectly helps to clean up environment.
- 4) Nitrates and nitrites are released into the soil, which helps in enriching the soil with necessary nutrients required for cultivation.
- 5) Nitrogen is an integral ~~compound~~ component of the cell and it forms many crucial compounds and important biomolecules.

Nitrogen also cycled by human activities such as combustion of fuels and the use of nitrogen fertilisers. These processes, increase the levels of nitrogen-containing compounds in the atmosphere. The fertilisers containing nitrogen are washed away in lakes and rivers and results in eutrophication.

CONCLUSION

Nitrogen is abundant in the atmosphere, but it is unusable to plants or animals unless it is converted into nitrogen compounds.

Nitrogen-fixing bacteria play a crucial role in fixing the atmospheric nitrogen into nitrogen compounds that can be used by the plants.

The plants absorb the usable nitrogen compounds from the soil through their roots. Then, these nitrogen compounds are used for the production of proteins and other compounds in the cell.

Animals assimilate nitrogen by consuming these plants or other animals that contain nitrogen. Humans consume proteins from these plants and animals and then, the nitrogen assimilates into our system.

During the final stages of the nitrogen cycle, bacteria and fungi help decompose organic matter, where the nitrogenous compounds get dissolved into the soil which is again used by the plants.

Some bacteria then convert these nitrogenous compounds in the soil and turn it into nitrogen gas. Eventually, it goes back to the atmosphere.

These sets of processes repeat continuously and thus maintain the percentage of nitrogen in the atmosphere.

ACKNOWLEDGEMENT

I convey my deep sence of gratitude to sir, for suggesting the way to find suitable for the development, in the preparation of the project manuscript. I owe to him in every sence for providing me with the facilities, valuable guidance and constant help throughout the course of ~~investigation~~ investigation.

Date- 15/11/20

Sudipta Das
Student's signature

GEKILICVLE

CERTIFICATE

certified that the project work
Submitted by SUDIPTA DAS is done
under the supervision of honourable
Subject teacher as a part of curriculum
for the partial fulfilment of the class
UGC 2nd semester.

Date - 15/11/20

Teacher's signature

ACKNOWLEDGEMENT

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE



NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE: Corona pandemic
and role of common people to control it.

NAME : Sudipta Kundu
COLLEGE ROLL NO : MTUGI/221/19
DEPARTMENT : Mathematics
YEAR : 2020
SIGNATURE : Sudipta Kundu

Introduction to Coronavirus

Coronaviruses are a family of viruses that cause illness such as respiratory diseases or gastrointestinal disease. Respiratory Syndrome can range from the common cold to more severe diseases e.g.

- Middle East Respiratory Syndrome (MERS-CoV)
- Severe Acute Respiratory Syndrome (SARS-CoV)

A novel coronavirus is a new strain that has not been identified in humans previously. Coronaviruses got their name from the way that they look under a microscope. The virus consists of a core, genetic material surrounded by an envelope with protein spikes. This gives it the appearance of a crown. The word Corona means "crown" in Latin.

Virus classification:

(unranked) : Virus

(Realm) : Riboviria

(Kingdom) : Orthornavirae

(Phylum) : Picuviricota

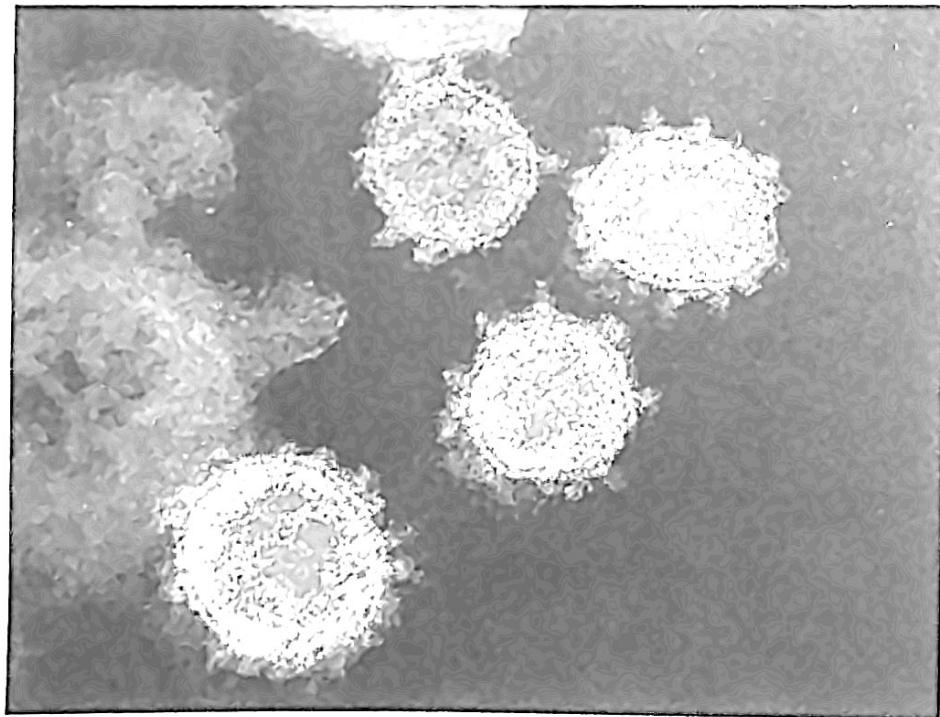
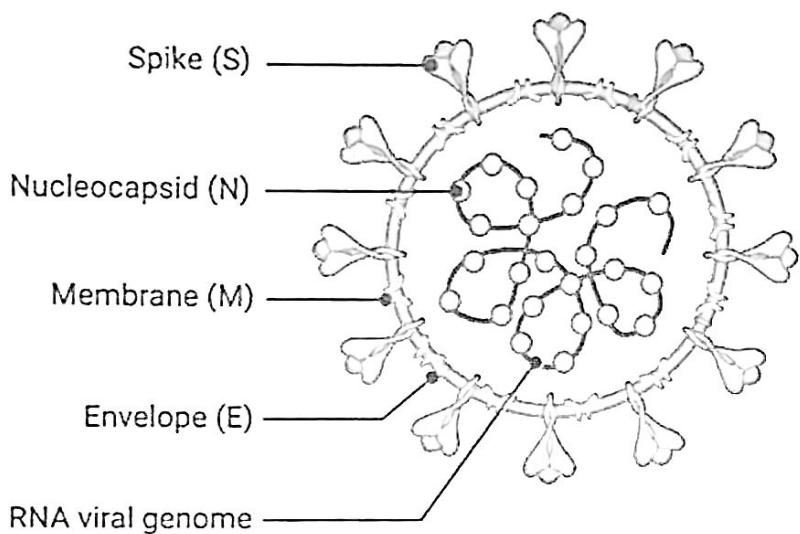
(Class) : Pisoniviricetes

(Order) : Nidovirales

(Family) : Coronaviridae

(Subfamily) : Orthocoronavirinae

Coronavirus Structure



Microscopic view.

Declaration of Pandemic:

The World Health Organisation (WHO) has declared the coronavirus disease 2019 (COVID-19) a pandemic. A global coordinated effort is needed to stop the further spread of the virus. A pandemic is defined as "occurring over a wide geographic area and affecting an exceptionally high proportion of the population". The last pandemic reported in the world was the H1N1 flu pandemic in 2009.

On 31 December, 2019, a cluster of cases of pneumonia of unknown cause, in the city of Wuhan, Hubei province in China, was reported to the World Health Organisation. In January 2020, a previously unknown new virus was identified, subsequently named the 2019 novel coronavirus, and samples obtained from cases & analysis of the virus' genetics indicated that this was the cause of the outbreak. This virus was named Coronavirus Disease 2019 (COVID-19) by WHO in February, 2020. The virus is referred to as SARS-CoV-2 & the associated disease is COVID-19.

Clinical Presentation

Typically Coronaviruses present with respiratory symptoms. Among those who will become infected, some will show no symptoms. Those who do develop symptoms may have a mild to moderate, but self-limiting disease with symptoms similar to the seasonal flu. Symptoms may include:

- Respiratory symptoms
- Fever
- Cough
- Shortness of breath
- Breathing difficulties
- Fatigue
- Sore throat

A minority group of people will present with more severe symptoms & will need to be hospitalised, most often with pneumonia, & in some instances, the illness can include ARDS, Sepsis & septic shock. Emergency warning signs where immediate medical attention should be sought include:

- Difficulty breathing or shortness of breath
- Persistent pain
- New confusion or inability to arouse
- Bluish lips or face

Transmission of COVID-19

Evidence is still emerging, but current information is indicating that human-to-human transmission is occurring. The routes of transmission of COVID-19 remains unclear at present, but evidence from other coronaviruses and respiratory diseases indicates that the disease may spread through large respiratory droplets & direct or indirect contact with infected secretions.

The incubation period of COVID-19 is currently understood to be between 2 to 14 days. This means that if a person remains well after 14 days after being in contact with a person with confirmed COVID-19, they are not infected.

Diagnostic Procedures

A COVID-19 diagnostic testing kit has been developed & is available in clinical testing labs. The gold standard for testing for COVID-19 is Reverse Transcription Polymerase Chain Reaction (RT-PCR) is only 30-70% effective for acute infection, this may be due to incorrect use of lab kits or not enough virus in the blood at the early stages of testing.

The CDC recommends that any person who is suspected of having COVID-19 & develops a fever & respiratory symptoms listed above are advised to call their healthcare practitioner to determine the best of course.

of action. The main criteria for testing are :

- Location
- Age
- Medical history and risk factors
- Exposure to the virus and contact history
- Duration of symptoms

If the above criteria are met it is advised that the following testing procedure is followed:

- Collect and test upper respiratory tract specimens, using a nasopharyngeal swab.
- If available testing of lower respiratory tract specimens
- If a productive cough is evident then a sputum specimen should be collected
- For patients who are receiving invasive mechanical ventilation, a lower respiratory tract aspirate or broncho-alveolar lavage sample should be collected

Imaging may be useful in identifying patients with COVID-19 which is especially relevant in places with good access to Imaging technology but poor access to reliable and quick laboratory testing. Chest X-rays are not especially sensitive for COVID-19, but chest CT gives a much more detailed appears to have good sensitivity in initial stages of the disease. However chest CT or X-ray is not currently recommended as a diagnostic method as they can easily be confused with other infections such as H1N1, SARS, MERS and seasonal flu. Lung ultrasound is also emerging as a valuable diagnostic testing procedure.

According to the CDC, even if a chest CT or X-ray suggests COVID-19, viral testing is the only specific method for diagnosis.

Case Definitions

The definitions used by the WHO in COVID-19:

Suspect case: Patient with acute respiratory illness (fever and at least one other symptom such as cough or difficulty breathing) and with no other aetiology that explains symptoms and a history of travel to a country or area that reported transmission of SARS-CoV-2 virus.

Probable case: A probable case is a suspected case for whom the report from laboratory testing for the COVID-19 virus is inconclusive.

Confirmed case: A confirmed case is a person with laboratory confirmation of infection with the COVID-19 virus, irrespective of clinical signs and symptoms.

Managements

In the case of mild to moderate symptoms the following considerations should be taken into account:

o Early identification: clinicians, especially physiotherapists, are most often in direct contact with their patients, which can make them infected or infected by others. It is therefore very important for physiotherapists

and other health professionals to be familiar with the condition of COVID-19, how to identify it and how to prevent it.

- Strategies for infection prevention and control (IPC): Suspect, probable and confirmed cases should be educated on IPC strategies to prevent transmission of the disease and health management strategies for quarantine
- Recognising and sorting patients with severe acute respiratory disease: Early recognition of suspected patients allows for timely initiation of IPC. Early identification of those with severe manifestations allows for immediate, optimised supportive care treatments and safe, rapid admission (or referral) to the intensive care unit according to institutional or national protocols. For those with mild illness, hospitalisation may not be required unless there is a concern for rapid deterioration. All patients discharged home should be instructed to return to the hospital if they develop any worsening of illness.
- Early supportive therapy and monitoring: Give supplemental oxygen therapy immediately to patients with severe acute respiratory illness (SARI) & respiratory distress, hypoxaemia, or shock. Use conservative fluid

management in patients with SARI when there is no evidence of shock. Closely monitor patients with SARI for signs of clinical deterioration, such as rapidly progressive respiratory failure and sepsis, and apply supportive care interventions immediately. Understand the patient's co-morbid conditions to tailor the management of critical illness and appreciate the prognosis.

- Collection of specimens for laboratory diagnosis: Collect blood cultures for bacteria that cause pneumonia and sepsis, ideally before antimicrobial therapy. Collect specimens from both the upper respiratory tract (nasopharyngeal and oropharyngeal) and lower respiratory tract.
- Management of respiratory failure and ARDS: Recognise severe hypoxaemic respiratory failure when a patient with respiratory distress is failing standard oxygen therapy. In the case of respiratory failure, intubation and protective mechanical ventilation may be necessary. Non-invasive techniques can be used in non-severe forms, however, if the scenario does not improve or even worsen within a short period of time (1-2 hours) then mechanical ventilation must be preferred.
- Management of septic shock: Haemodynamic support is essential for managing septic shock.

• Treatment interventions: There is no current evidence from RCTs to recommend any specific anti-nCoV treatment for patients with suspected or confirmed COVID-19 infection. A recent review stresses the importance of a multi-professional approach in treating critically ill children and adolescents with SARS-CoV-2 infection. It proposes the analysis of radiologic findings appropriate fluid therapy, hemodynamic support, early nutritional therapy and physiotherapy; however, other therapeutics such as corticosteroids, antiviral therapy, antithrombotic therapy, and use of immunoglobulins can be considered after the substantial evaluation.

❑ Role of people to control infection

The WHO suggests the following basic preventative measures to protect against the new coronavirus.

- Stay up to date with the latest information on the COVID-19 outbreak through WHO updates or your local and national public health authority.
- Perform hand hygiene frequently with an alcohol-based hand rub if your hands are not visibly dirty or with soap and water if hands are dirty.
- Avoid touching your eyes, nose and mouth.

- Practice respiratory hygiene by coughing or sneezing into a bent elbow or tissue and then immediately disposing of the tissue.
- Wear a medical mask if you have respiratory symptoms and performing hand hygiene after disposing of the mask.
- Maintain social distancing (approximately 2 meters) from individuals with respiratory syndromes.
- Always avoid crowd area.

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NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE:

Nutrient cycle, gaseous and sedimentary
nutrient cycle ; Nitrogen, oxygen and
Carbon cycle .

NAME : SUDIPTA PRAMANIK
COLLEGE ROLL NO : CHUG / 162 / 19
DEPARTMENT : CHEMISTRY
YEAR : 2020
SIGNATURE : Sudipta Pramanik

CONTENTS

- 1) What is nutrient cycle?
- 2) Global Nutrient cycles and its classification .
- 3) Oxygen cycle :-
 - i) Definition
 - ii) Main reservoir
 - iii) steps
 - iv) processes
 - v) some important facts
 - vi) Main importance .
- 4) Carbon cycle :-
 - i) Definition
 - ii) steps
 - iii) schematic diagram
 - iv) Land carbon cycle
 - v) oceanic carbon cycle
 - vi) Key points

CONTENTS

- 5) What is Nitrogen cycle?
 - i) Introduction
 - ii) Basics
 - iii) Nitrogen conversions in soil
 - iv) A Global flow chart for soil Nitrogen
 - v) N₂ cycle of ecosystem.
- 6) N cycle reactions and related process.
- 7) Ammonification .
- 8) nitrification .
- 9) Denitrification .
- 10) N₂ cycle's importance for living beings.
- 11) conclusion .
- 12) ACKnow1edgement .
- 13) Certificate .

1) What is Nutrient cycle?

Living organisms need food to grow and to reproduce. Any food or element required by an organism to live, - grow, or reproduce, is called nutrient.

Depending on the amount it is needed in, a nutrient can be classified as a macronutrient (needed in large quantities e.g., carbon, oxygen, hydrogen, nitrogen, phosphorous etc.) or micronutrient (needed in small quantities e.g., iron, zinc, copper, iodine etc.). In nature, the nutrient elements and their compounds continuously move from the non-living environment to be the living organisms, and back to the non-living environment. This cyclic movement of minerals from their reservoirs (air, water, soil), to the living components, and back to the reservoir is called nutrient or biogeochemical cycling.

2) Global Nutrient cycles and its classification :-

An adequate and balanced supply of elements necessary for life, provided through the ecological processes of nutrient cycling, underpins all other ecosystem services.

— Global Nutrient cycles.

Broadly speaking, nutrients can occur in gaseous form (such as N_2 , CO_2), mineral form (such as apatite), inorganic form (such, NH_4^+ , NO_3^-) and as well as organic form (c based compound).

* Nutrient cycles are mainly classified into three cycles

i) Oxygen cycle

ii) Carbon cycle

iii) Nitrogen cycle.

3) Oxygen cycle :-

i) Definition :-

The cyclic movement of oxygen from their reservoir (air, water, soil) to the living being and back to the reservoir is called oxygen cycle.

Oxygen cycle, along with the carbon cycle and nitrogen cycle play an essential role in the existence of life on the earth. The oxygen cycle is a biological process which helps in maintaining the oxygen level by moving through three main spheres of the earth which are

- ① Atmosphere
- ② Lithosphere
- ③ Biosphere

ii)

Main reservoir:

The main reservoirs of oxygen are:

1) Atmosphere

2) Biosphere

3) Hydrosphere

4) Lithosphere

iii)

Steps of O₂ cycle:

The steps involved in the oxygen cycle are:

Stage-1 → All green plants during the process of photosynthesis, release oxygen back into the atmosphere as a by-pdt.

Stage-2 → All aerobic organisms use free oxygen for respiration.

stage-3 → Animals exhale carbon-dioxide back into the atmosphere which is again used by the plants during photosynthesis. Now oxygen is balanced within the atmosphere.

iv) process of O₂ cycle :-

The four processes that use atmospheric oxygen are:-

- 1) Breathing ..
- 2) Decomposition ..
- 3) Combustion ..
- 4) Rusting ..

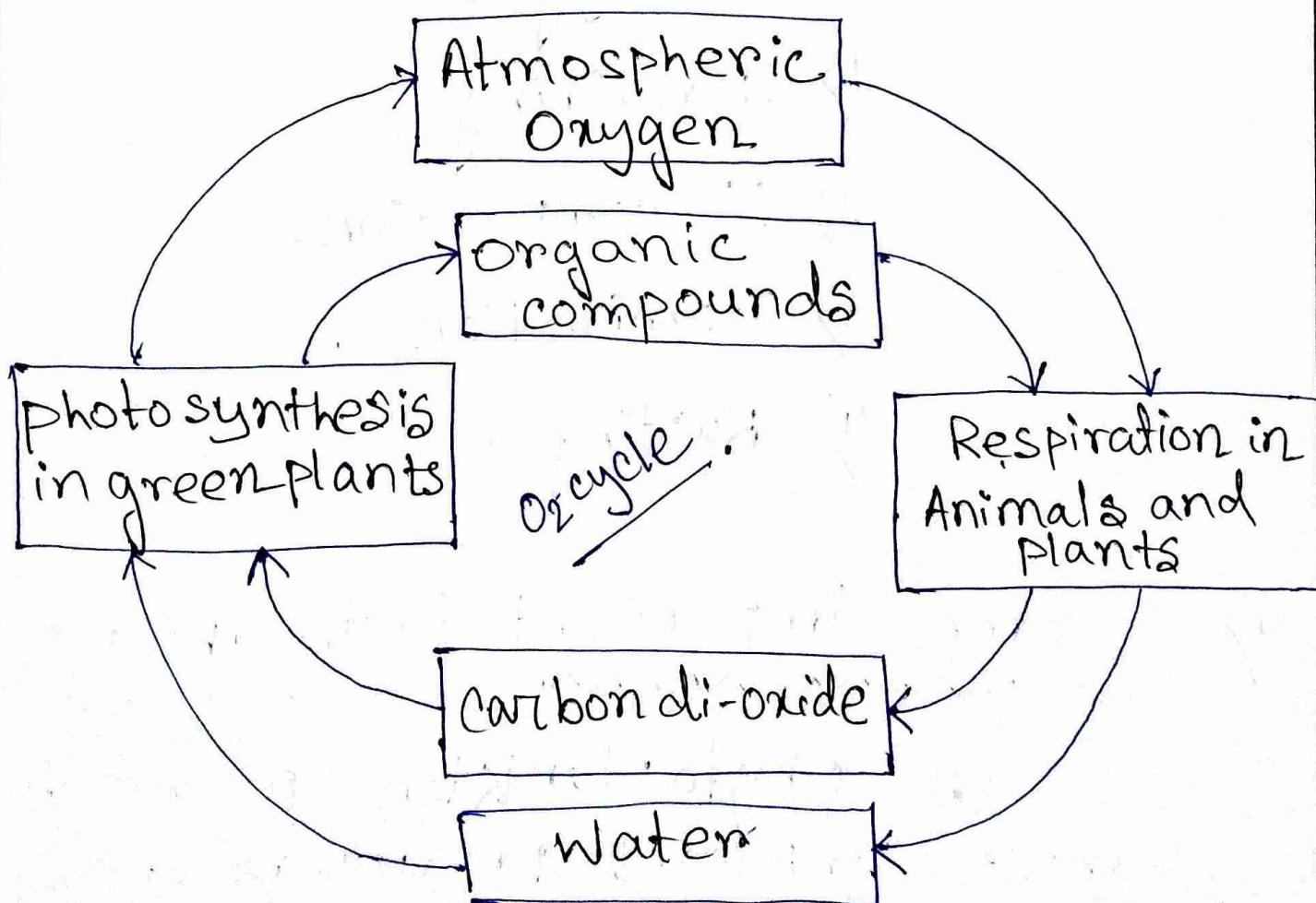
v) some important facts about O₂ cycle

- ① Phytoplankton is one of the most significant producers of oxygen

followed by terrestrial plants and trees.

① Oxygen is also produced when the sunlight reacts with water vapour present in the atmosphere.

② A large amount of oxygen is stored in the earth's crust in the form of oxides, which cannot be used for the respiration process as it is available in the combined state.



vi)

Main importance of O₂ cycle:-

Oxygen is one of the most essential components of the Earth's atmosphere. It is mainly required for:

- Breathing
- Combustion
- Supporting aquatic life.
- Decomposition of organic waste.

The Oxygen cycle is mainly involved in maintaining the level of oxygen in the atmosphere. The entire cycle can be summarised as, the O₂ cycle begins with the process of photosynthesis, in the presence of sunlight, releases oxygen back into the atmosphere, which humans and animals breathe in oxygen and breathe out CO₂ and again linking back to the plants. This also proves that both the oxygen and carbon cycle occur independently and are interconnected to each other.

4)

Carbon Cycle :-

i) Definition :- Carbon cycle is the process where carbon compounds are interchanged among the biosphere, geosphere, pedosphere, hydrosphere and atmosphere of the earth.

ii)

Carbon cycle steps :-

The major steps involved in the processes of the carbon cycle :-

1) Carbon present in the atmosphere is absorbed by plants for photosynthesis.

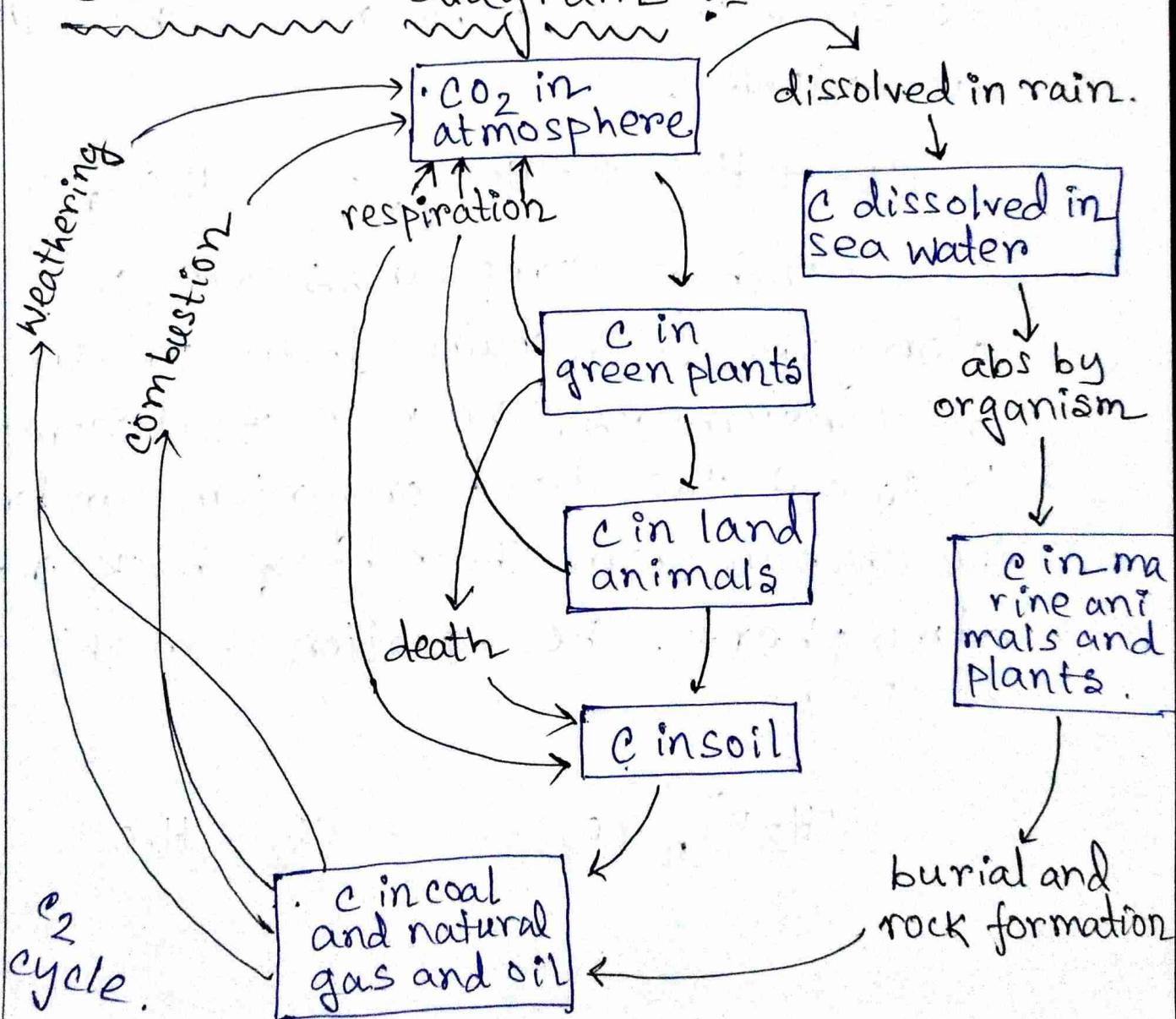
2) These plants are then consumed by animals, and carbon gets bioaccumulated into their bodies.

ii) 3) These animals and plants eventually die, and upon decomposing, carbon is released back into the atmosphere.

4) some of the carbon that is not released back into the atmosphere eventually become fossil fuels.

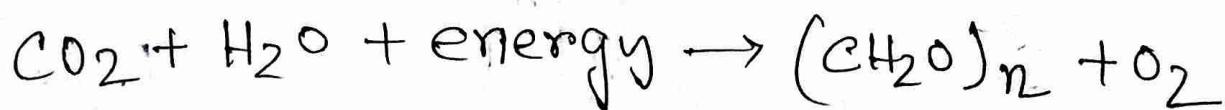
iii)

Schematic diagram :-

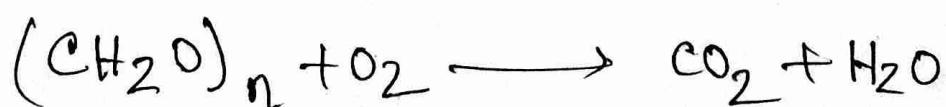


iv) Land carbon cycle :-

Carbon in atmosphere is present in the form of CO_2 . Carbon enters the atmosphere through natural processes such as respiration and industrial applications such as burning fossil fuels. The process of photosynthesis involves the absorption of CO_2 by plants to produce carbohydrate. The eqn is as follows :



carbon compounds are passed along the food chain from producers to consumers. The role of decomposers is to eat the dead organism and return the carbon from their body back into the atmosphere. The equation for this process is :



✓ Oceanic carbon cycle :-

This is essentially a carbon cycle but in the sea. Ecologically, oceans take in more carbon than it gives out. Hence, it is called a "carbon sink". Marine animals convert carbon to calcium carbonate and this forms the raw building materials required to create hard shells, similar to the ones found in clams and oysters.

When organisms with calcium carbonate shells die, their body decomposes, leaving behind their hard shells. These accumulate on the seafloor and are eventually broken down by the waves and compacted under enormous pressure, forming limestone.

vi)

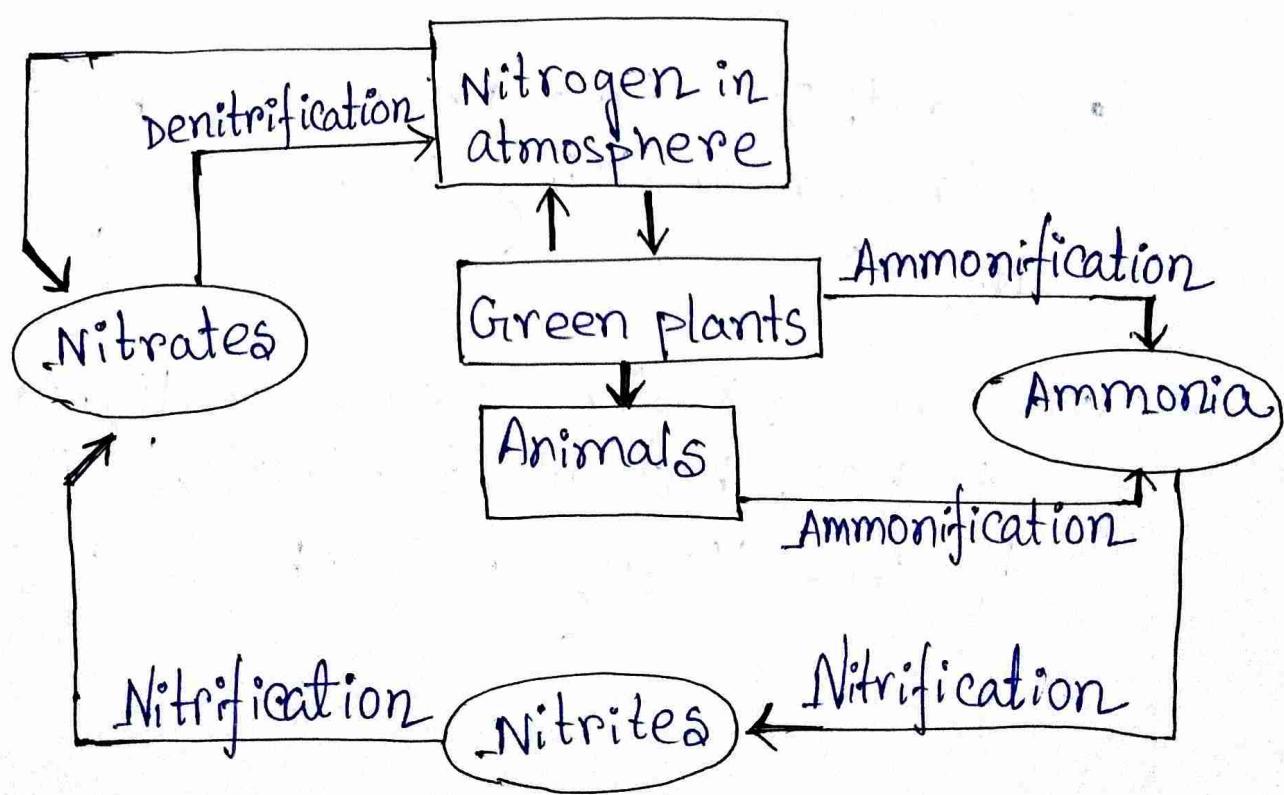
Key points on carbon cycle :-

- ① carbon cycle explains the movement of carbon b/wn the earth's biosphere, geosphere, hydrosphere and atmosphere.
- ② carbon is an important - element of life.
- ③ The formation of fossil fuels and sedimentary rocks contribute to the carbon cycle for very long periods.
- ④ The carbon cycle is associated with the availability of other compounds as well.
- ⑤ Carbon atoms are released as carbon dioxide (CO_2) when organisms respire.

5) What is Nitrogen cycle ?

=> The nitrogen cycle is the biogeomical cycle that describes the transformations of nitrogen and nitrogen-containing compounds in nature.

It is shown that 95% of the N₂ flow in the global terrestrial system is restricted to the plant-microorganism-soil system ; only 5% of the total flow is concerned with exchanges to and from the atmosphere and the hydrosphere.



i) Introduction :-

Annual N_2 transfers btwn soil and vegetation by far exceed other global nitrogen transfer. Its main characteristics are -

- most commonly limiting nutrient
- important plant nutrient.
- critical for food production
- human manipulation is intense
- pollutant in water and air.

ii) The Basics :-

- ① Earth's atmosphere is about 78% nitrogen making it the largest pool of N_2 .
- ② Some fixation occurs in lightning strikes, but most fixation is done by free living or symbiotic bacteria.

- ① Nitrogen is essential for many biological processes, it is in all amino acids, is incorporated into proteins, and is present in the bases that make up nucleic acids, such as DNA and RNA.
- ② In plants, much of the nitrogen is used in chlorophyll molecules which are essential for photosynthesis and further growth.

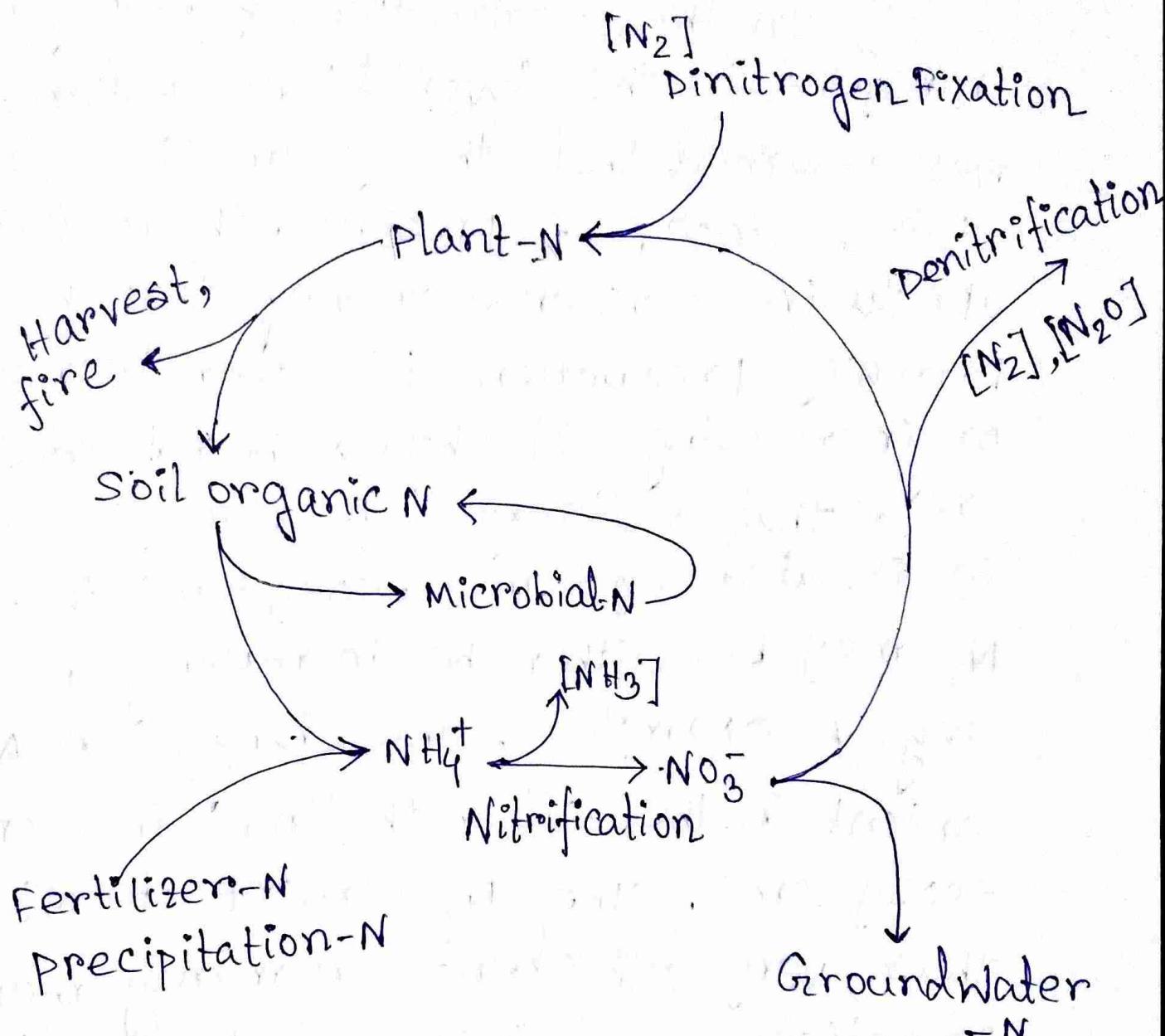
iii) Nitrogen conversions in Soil :-

The vegetational cover of the earth is dependent on inorganic nitrogen for growth, and the amounts of plant-available ammonium- or nitrate-nitrogen at any one time are usually limiting. The ammonium nitrogen in soil water is in equilibrium with exchangeable inorganic nitrogen, which is bound to clay minerals and organic colloids. The amount of exchangeable and soluble inorganic nitrogen rarely

exceed 2% of total soil nitrogen (Harmsen & Kolenbrander, 1965). Ammonium can also be fixed to clay minerals in such a way that it becomes unavailable, and amounts of fixed nitrogen have been reported attaining levels above 40% of total soil Nitrogen (Young, 1962).

Molecular nitrogen is fixed by certain bacteria and blue-green algae, becoming bound in the form of protein in biomass. Biological nitrogen fixation is one of the major inputs of nitrogen to the soil system. The ammonium vegetation type is restricted to soils with a low pH, which limits the activity of nitrifying bacteria. The nitrate-type is confined to wet tropical forests and certain deciduous forests on soils with high pH.

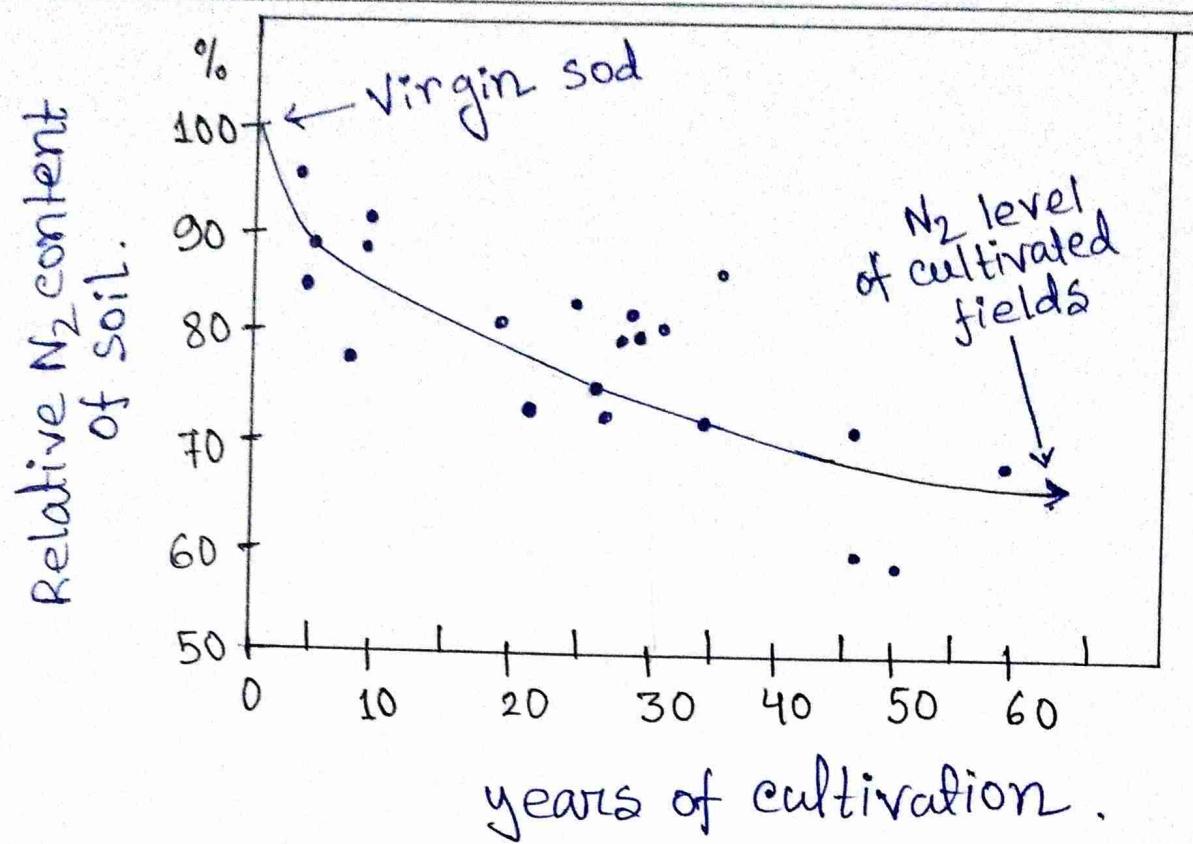
iV) A Global chart for soil Nitrogen :-



⟨ The Global Nitrogen cycle ⟩

✓) N_2 cycle of ecosystem :-

In the estimation of nitrogen transfers in the 'world' ecosystem, it was assumed that the system is in a steady state, since, at present, there is no conclusive evidence proving that world primary production is either decreasing or increasing. It should be realized, however, that a steady state rarely occurs in isolated system (ecosystems) in which N_2 may be either be increasing or decreasing. As examples, the changes in N_2 content in the soil with time in a cropped ecosystems. The N_2 content of soil is thus very dependent on management-practices, and increased land cultivation will surely affect the N_2 content of the soil and consequently affect the total N_2 cycle.

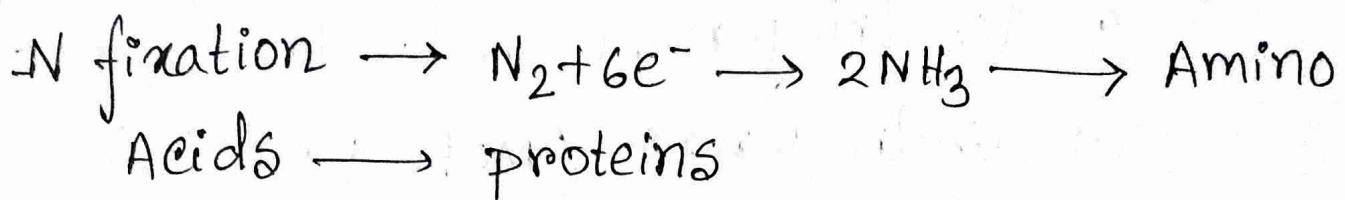


— Ecosystem conserve N₂ by a more or less closed cycle of N₂ btwn the vegetation and the soil, and it is generally agreed that the developmental stages of ecosystem tend to have a more open nutrient cycle as compare with the mature (climax) stages (Odum, 1969). Thus large amounts of N₂ are removed from the system in annual harvests. The system thus has large inputs/outputs, and is only prevented from running low in N₂ by addn of fertilizers.

6>

N cycle reactions and related processes:

- ↑ Oxidation States of N
- most transformations are biotic,
most carried out by micro-organism.

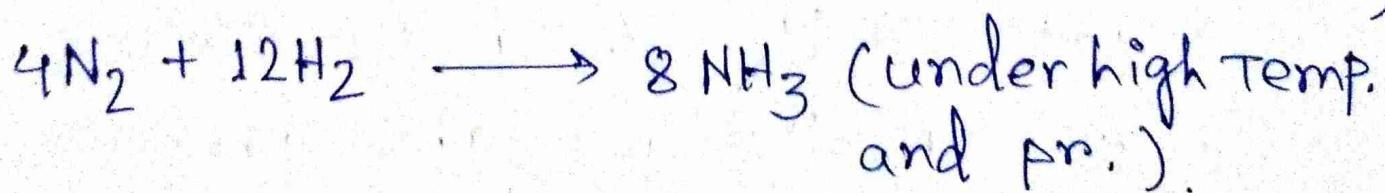
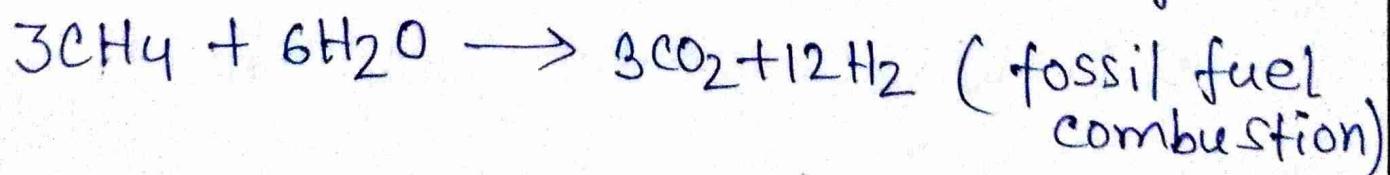


- Large energy input required to break that N to N triple bond.
- free-living and mutualistic approaches to obtaining this energy.

- ① cyanobacteria pair photosynthesis and N_2 fixation.
- ① Rhizobium associates with plants, gets photosynthate in return for giving up some NH_3 .
- ① Frankia associates with alder trees.
- ① heterotrophy (Azotobacter, others).
- ① more N_2 fixation in rhizosphere (Azotobacter).

- typically occurs in environment with low or limiting NH_3 concentrations.
- N fixation done by enzyme complex, Nitrogenase, encoded by nif genes.
 - dinitrogenase reductase (Fe protein)
 - dinitrogenase (MoFe protein)
- nitrogenase very sensitive to O_2
 - reduced oxygen tension (Azospirillum)
 - Anaerobic heterotrophs (Clostridium)
 - Anoxygenic phototrops (Rhodospirillum)
 - Protective structures - root nodule for Rhizobium, heterocysts in Cyanobacteria

Haber-Bosch process (industrial fertilizer)
 i.e., human N fixation



7)

Ammonification :-

Organic matter N \rightarrow NH_3^+ (in acid to neutral aq. soln)

- organic to inorganic, so decomposition.
- plant detritus C-C-C-C-NH₂, microbes eat up C for growth and energy.

e.g., 1) Sawdust, C:N = 225 : 1

bacteria C:N = 6 : 1

result : to get C, the bacteria scavenges N from soil

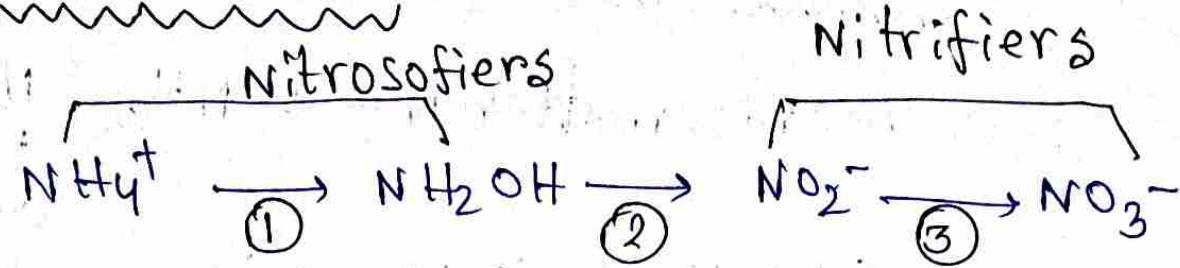
\rightarrow IMMOBILIZATION

*> fate of $\text{NH}_4^+ \rightarrow$

- plant uptake
- microglobal uptake
- Volatilization
- bound to clay
- nitrification
- bound to soil colloids or humus.

8>

Nitrification :-



1 = ammonia monooxygenase

2 = hydroxylamine oxidoreductase

3 = nitrite oxidoreductase

two steps process ($\text{NH}_4^+ \rightarrow \text{NO}_2^-$

and $\text{NO}_2^- \rightarrow \text{NO}_3^-$)

① first step by nitrosifiers

(Nitrosomonas)

② second step by nitrifiers

(Nitrobacter)

③ steps are closely coupled.

④ fate of $\text{NO}_3^- \Rightarrow$

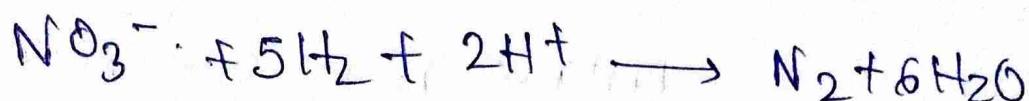
① plant uptake

② leaching, runoff

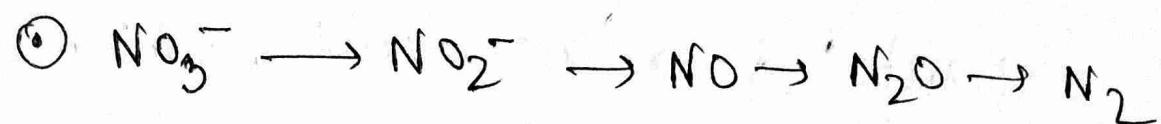
③ reduction to NH_4^+

④ reduction to dinitrogen gas (N_2)

g) Denitrification :-



→ Multi step process.



- ② 1st step by nitrate reductase,
2nd step by nitrite reductase

→ environmentally-limited process.

- ① carbon-rich-environment
- ② few e⁻ acceptors
- ③ sewage sludge
- ④ stagnant water
- ⑤ some sediments (high org. matter)
- ⑥ rumen.

⑦ Fate of products (NO , N_2O , N_2), -

- ① gaseous loss to atmosphere.
- ② output of N from ecosystem.
- ③ reduces soil fertility.
- ④ reduces NO_3^- leaching.

10)

N₂ cycle for living being:

Nitrogen is essential for all living things, because it is a major part of amino acids, which are the building blocks of proteins and of nucleic acids such as DNA, which transfers genetic information to subsequent generation of organisms. About 78% of the atmosphere is made by N₂, but plants and animals can't take nitrogen directly from the air. A process called the nitrogen cycle makes this happen.

11.

CONCLUSIONS

The biosphere has developed over millions of years to a mature system - With a very closed N_2 cycle. On a global scale, 95% of the annual N_2 flows occur within the soil & btwn soil and vegetation.

The earth, as well as individual ecosystems, seems to have adapted to a fairly constant turnover rate for N_2 in various components. Although the total magnitudes for the flows vary, the turnover rates for separate components are very similar.

At present, man induced change probably affect the prevailing patterns of N_2 conversions - to a minor extent. It should be noted that small changes have profound effects - for example the catalytic action of oxides of N_2 on the ozone layer.

12.

ACKNOWLEDGEMENT

I convey my deep sense of gratitude to sir, for suggesting the way to find suitable for the development, in the preparation of the project manuscript. I owe to him in every sense for providing me with the facilities, valuable guidance and constant help throughout the course of investigation.

Date :- 05/11/2020

Sudipta Pramanik
Signature of the
Student

college Roll No- CHUG21162119.

P-30

13.
-

CERTIFICATE

Certified that the project work
Submitted by - Sudipta Pramanik
is done under the supervision of my
honorable sir as a part of curriculum
for the partial fulfilment of the class
- UG 2nd semester.

Date:- 05/11/2020

Signature of the
Teacher

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE



NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE:

Air pollution in cities and
measures to control it

NAME : Sujoy Paul
COLLEGE ROLL NO : BNUG/192/19
DEPARTMENT : Bengali
YEAR : 2020
SIGNATURE :

ACKNOWLEDGMENT

The success and final outcome of this Project required a lot of guidance and assistance from many people and I am extremely privileged to have got this all along the completion of my project. All that I have done is only due to such supervision and assistance and I would not forget to thank them.

I respect and thank Prof. N.C. Maity for providing me an opportunity to do the project work and giving us all support and guidance which made me complete the project duly. I am extremely thankful to him for providing such a nice support and guidance.

I am thankful to and fortunate necessary information constant encouragement, support and guidance from all teaching staffs of Bengal Department, which helped us all in successfully completing our project work.

Sujay Paul.

Teacher signature

Student signature

INTRODUCTION

Environmental issues :-

Human population size

has grown enormously over the last hundred years. This means increase in demand for food, water, home, electricity, roads, all vehicles and numerous other commodities. These demands are exerting tremendous pressure on our natural resources and are also contributing to pollution.

Pollution is any undesirable change in physical, chemical or biological characteristics of air, land, water or soil. Agents that bring about such undesirable life change are called pollutants. In order to control environmental pollution the Government of India has passed the Environment (Protection) Act 1986 to protect and improve the quality of our environment (air, water and soil).

Air Pollution Sources and measures to control it

It is the increased or presence of any material in air in such a concentration which is harmful to man, vegetation, animal and their environment. Substances and factors which cause air pollution are called air pollutants. Air pollution can be both natural and anthropogenic.

anthropogenic pollution comes from both mobile and fixed sources. Air pollutants coming directly from the pollution

History of air pollution

The origin of air pollution on the earth can be traced from the times when man started using firewood as a means of cooking and heating. Air pollution became more pronounced especially in urban areas. It was recognized as a problem 700 years ago in London in the form of smoke pollution, which plagued King Edward.

9

In 1963 to make the first anti-pollution law to restrain people from using coal for domestic heating the use of coal was passed. Defying the law led to imposition of capital punishment. In spite of this year air pollution became a problem in London during the Industrial revolution due to the use of coal in industrial fuel. The earliest recorded major disaster was the in 1952 that resulted in more than 4000 deaths due to the accumulation of air pollutants over the city for six days.

In Europe around the middle of the 19th century, a black form of the powdered moth was noticed in industrial areas. usually the normal species being white the powdered pattered surface were successful in scaring off most industrial species.

Air Pollution began to increase in the beginning of the twentieth century with the development of road and large-scale use of petrol and diesel. The severe air quality problems due to the formation of photochemical smog from the combustion residues of diesel and petrol engines were felt for the first time in 1952. Ozone pollution due to auto-exhaust in many developed and developing countries including India.

Sources of air pollution :-

The sources of air pollution can be divided into two categories.

i) Natural sources:-

- (a) Ash from burning volcanoes, dust from storms, forest fires

- (b) Pollen grains from flowers in air.

1) Anthropogenic (Human-made) sources:

- (a) Power stations using coal or crude oil.
- (b) Furnaces using coal, coke, charcoal, lime, fine wood, kerosene, etc.
- (c) steam engines used in railways, steam motor, motor vehicles etc.
- (d) road and industrial combustion engines which run on petrol, diesel, kerosene etc.

major air pollution:

Some major air pollution one disscussed here carbon dioxide, it is mainly produced during the combustion of fuel in factories. The increasing CO₂ in the atmosphere is likely to have the following effects.

- (i) rise in atmosphere temperature due to green house effect.

III. Pollution and vegetation.

(i) The direct use of sulphur affects the growth of plants both obtained by destroying chlorophyll and also by disintegrating.

(ii) Rise of smoke causes necrosis i.e. burning the leaves.

(iii) The rise of smoke causes pollution i.e. presence full of tars.

iv. Pollution on animals.

(i) When the animals during grazing consume the sulphuric acid plants mainly with acidic and organic they get affected or dieing or even death.

(ii) The birds also suffer due to the lung disease.

Effect on non-living's :-

Effect on metals :-

(i) corrosion or abrasion of metals.

(ii) the acid gases like O_3 , SO_2 , NO_2 , affect the strength of the textile.

(iii) SO_2 and acid gases affect the quality of P.P.P and etc.

(iv) SO_2 and acid gases affect the quality of by SO_2 .

(v) the paints get decoloured by SO_2 and H_2S .

CONCLUSION

The air Pollution (Prevention and control of pollution) Act 1981
The act deals with the preservation of air quality and the control of air pollution with a concern for the detrimental effects of air pollution on human health and also on the biological world. In 1987, smog was recognised as an air pollution.

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE



NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE: Water Pollution and
Measures to control
It

NAME : Sukhen Mandal
COLLEGE ROLL NO : CHU61/218/19
DEPARTMENT : Chemistry
YEAR : 2020
SIGNATURE : Sukhen Mandal

► Content :-

- Introduction (Page 2 - Page 3)
- Source of water pollution (Page 3 - Page 5)
- Effect of water Pollution (Pages - Page - 8)
- Control of water pollution (Page 9 - Page 11)

Water Pollution

Introduction:-

What is one of the renewable resources essential for sustaining all forms of life, food production, economic development, and for general well being. Many substances are important for our life. Water is also most manageable natural resources as it is capable of diversion, transport, storage, recycling. All these properties impart to water its great utility for human beings. The surface water and ground water resources of the country play a major role in agriculture, hydropower generation, livestock production, industrial activities, forestry, fisheries, navigation, recreational activities etc. The freshwater ecosystem of the world comprise only about 0.5% of the earth surface and have a volume $2.84 \times 10^5 \text{ km}^3$. Rivers constitute an insignificant amount (0.1%) of the land surface. Only 0.01% of water of the earth occur in river channels. In this way water distributes in many places of the earth.

In the last few decades, there has been a tremendous increase in the demand for freshwater due to rapid growth of population and the accelerated pace of industrialization. In addition, deficient water resources have increasingly restrained water pollution control and water quality improvement. Water pollution has been a research focus for government and scientists.

Therefore, protecting river water quality is extremely urgent because of serious water pollution and global scarcity of water resources.

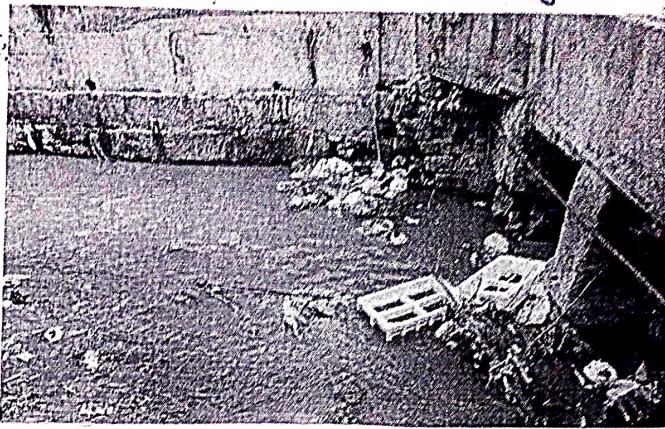
Sources of water pollution:-

Some of the important sources of water pollution are discussed below -

➤ Urbanization:- Urbanization generally leads to phosphorus concentrations in urban catchments. Increasing imperviousness, increased runoff from urbanized surfaces, and increased municipal and industrial discharges all result in increased loadings of nutrients to urban streams. This makes urbanization second only to agriculture as the major cause of stream impairment.

➤ Sewage and other Oxygen Demanding wastes:- Management of solid waste is not successful due to huge volumes of organic and non-biodegradable wastes generated daily. As a consequence, garbage in most parts of India is unscientifically disposed and ultimately leads to increase in the pollutant load of surface and groundwater courses. Chemical fertilizers used by farmers also add nutrients to the soil, which drain into rivers and seas and add to the fertilizing effect of the sewage. Together sewage and fertilizers can cause a massive increase in the growth of algae or plankton that ~~do~~ facilitate huge areas of oceans, leaks on rivers creating a

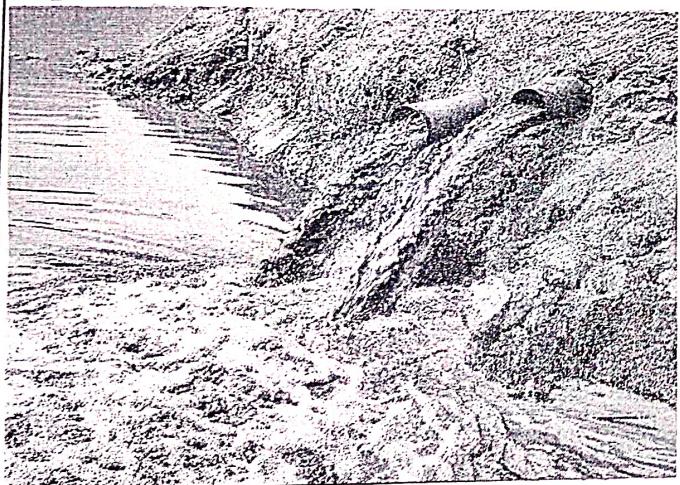
condition known as algal bloom thereby reducing the dissolved oxygen content of water and killing other forms of life like fish.



► Industrial Wastes:- Many of the industries are situated along the banks of rivers such as steel and paper industries for their requirement of huge amounts of water in manufacturing processes and finally their wastes containing acids, alkalis, dyes and other chemicals are dumped and poured down into rivers as effluents. Chemical industries concerning with manufacture of Aluminium release large amount of fluoride through their emission to air and effluents to water bodies.

All such discharges finally arrive at water bodies in the form of effluents affecting human health and the organism living there.

► Agro-chemical wastes:- In the agricultural sector, water is electricity for irrigation are subsidized for political reasons. These leads to wasteful flood irrigation rather than adoption of more optimal practices such as sprinkler and drip irrigation. Cropping patterns and farming practices also do

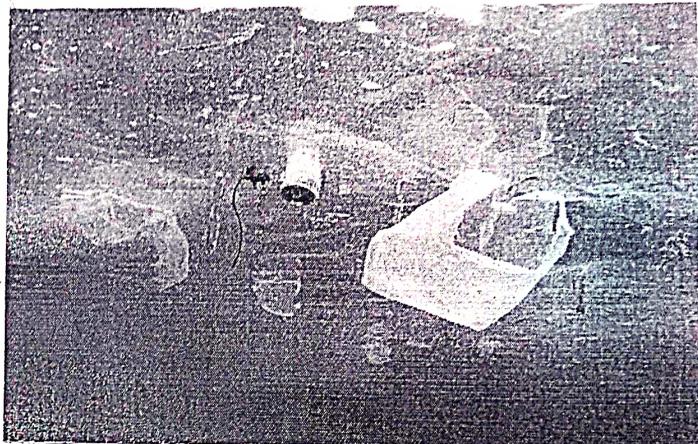


not necessarily encourage the judicious use of water.

There uses many pesticides, e.g. DDT, BHC, Aldrin, Malathion, etc. These chemicals may reach human through food chain leading to biomagnification.

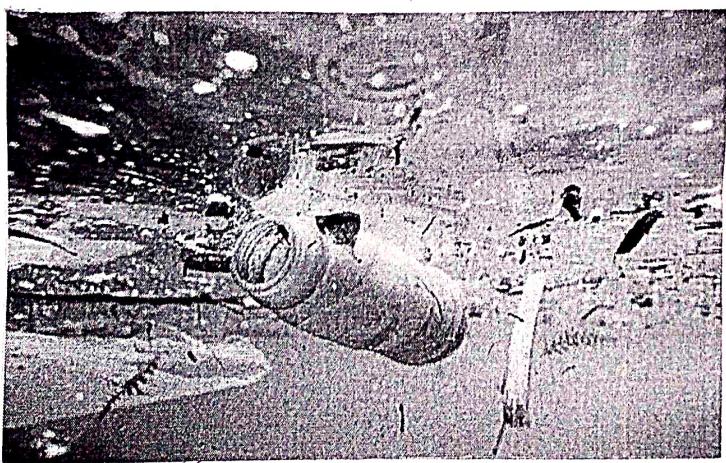


► Oil spillage:- Oil discharge into the surface of sea by way of accident or leakage from cargo tankers carrying petrol, diesel, and their derivatives pollute sea water to a great extent. Exploration of oil from offshore also lead to oil pollution in water. The residual oil spreads over the water surface forming a thin layer of water-in-oil emulsion.



► Radioactive waste:-

Radioactive pollution is caused by the presence of radioactive materials in water. They are classified as small doses which temporary stimulate the metabolism and large doses which gradually damage the organism causing genetic mutation. It pollutes water heavily.

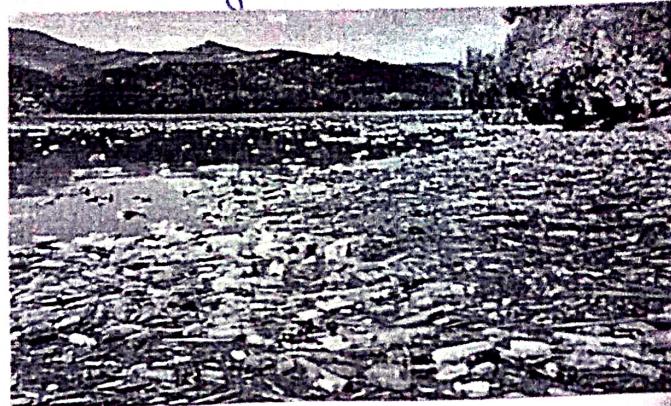


Effects of Water Pollution:-

Polluted water has effects on both human and aquatic life.

Effects of water pollution on human health:- Some of the chemicals are affecting human health are the presence of heavy metals such as Fluoride, Arsenic, Lead, Cadmium, Mercury, petrochemicals, chlorinated solvents and nitrates. Arsenic is a very toxic chemical that reaches the water naturally or from waste water of tanneries, ceramic industry, chemical factories and from insecticides such as lead arsenide, effluents from fertilizers factories and from fumes coming out from burning of coal and petroleum. Arsenic is highly dangerous for human health causing respiratory cancers, arsenic skin lesion from contaminated drinking water in some districts of West Bengal. Long exposure leads to bladder and lungs cancer. Lead is contaminated in the drinking water source from pipes, fitting, solder, household plumbing system. In the human beings, it affects the blood, central nervous system and the kidneys. Child and pregnant women are mostly prone to lead exposure. Mercury is used in industries such as smelters, manufacturers of batteries, thermometers, pesticides, fungicides etc. The best known example of mercury pollution is in the oceans took place in 1938 when a Japanese factory discharged a significant amount of mercury.

into Minamata Bay, by contaminating the fish stocks there. It tooks several years to show its effect. Mercury shows biological magnification in ecosystem. Cadmium reaches human body by water and other foods. For water pollution by ~~and~~ cadmium results into 'itai-itai' disease, nephritis, nephrosis etc. This type of deaseases are happens in human body by water pollution.



► Effect of Water Pollution on Plants:-

The following are the effects of water pollution on plants-

i) Effects of acid deposition: Many of the gases from acid, aerosols and other acidic substances released into the atmosphere from industrial or domestic sources combustion from fossil fuels finally fall down to ground and reach the water bodies along with rainwater from polluted soil surfaces thereby causing acidification of water bodies by lowering its pH. In many countries chemical substances like sulphates, nitrates and chloride have been reported to make water bodies such as lakes, river and ponds acidic.

ii) Nutrient deficiency in aquatic ecosystem:-

Population of decomposing microorganisms like bacteria and fungi decline

in acidified water which in turn reduces the rate of decomposition of organic matter affecting the nutrient cycle. The critical pH for most of the species is 6.0. The diversity of species decline below the pH whereas the number and abundance of acid tolerant species increases. It is observed that plants with deep roots and rhizomes are less affected while plants with short root system are severely affected in acidic water.

iii) Effect of Agricultural chemicals: chemicals from fertilizers, pesticides, insecticides, herbicides etc. applied to crops in excess are washed away with rainwater as runoff, then enter into soil and finally arrive at the water bodies. Chemicals from fertilizers result in eutrophication by enrichments of nutrients. Ammonium from fertilizers is acidic in nature causing acidification of waters. Similarly pesticides, herbicides, insecticides also cause change pH of the water bodies. Most common effect of these substances is the reduction in photosynthetic rate. Some may uncouple oxidative phosphorylation or inhibit nitrate reductase enzyme. The uptake and bioaccumulation capacities of these substances are great in macrophytic plants due to their low solubility in water.

● Control of Water Pollution:-

The key challenges to better management of the water quality in India comprise of temporal and spatial variation of rainfall, uneven geographic distribution of surface water resources, persistent droughts, overuse of groundwater and contamination, drainage and salinisation and water quality problems due to treated partially treated and untreated wastewater from urban settlements, industrial establishment and runoff from irrigation sector besides poor management of municipal solid waste and animal dung in rural areas. Some of the control measures are given below:-

- i) The Ganga Action Plan and the National River plan are being implemented for addressing the task of tapping, diversion and treatment of municipal waste water.
- ii) In most parts of the country, waste water from domestic sources is hardly treated, due to inadequate sanitization facilities. This waste water, containing highly organic pollutant load, finds its way into surface and groundwater courses near the vicinity of human habitation from where further water is drawn for use. Considerable investments should be done to install ~~to~~ the treatment systems.
- iii) For the agricultural sector, water and electricity for irrigation are subsidized for political reason. This leads to wasteful flood irrigation ~~as~~ rather than adoption of more optimal

practices such as sprinklers and drip irrigation. Optimised irrigation, cropping patterns and farming practices should be encouraged for judicious use of water.

- iv) There should be ban on washing of clothes and laundry alongside the river bank.
- v) Industries should install Effluent Treatment Plant (ETP) to control the pollution at source.
- vi) All towns and cities must have sewage treatment plants (STPs) that clean up the sewage effluents.
- vii) Improper use of fertilizers, herbicides, pesticides in farming should be stopped and organic methods of farming should be adopted. Cropping practices in riparian zone should be banned to protect the riparian vegetation growing there.
- viii) Religious practices that pollute river water by dumping colourful paints of idols containing harmful synthetic chemicals should be stopped.
- ix) Rain water harvesting should be practiced to prevent the depletion of water table.
- x) Making people aware of the problem is the first step to prevent water pollution. Hence, importance of water and pollution prevention measures should be a part of awareness and education programme.

- xii) Polluter pays principle should be adopted so that the polluters will be the first people to suffer by way of paying the cost for the pollution. Ultimately, the polluter pays principle should be designed to prevent people from polluting and making them behave in an environmentally responsible manner.
- xiii) As riparian vegetation helps in making the river water clean because of the multiple functions to prevent people from felling and clearing down of riparian forest zones for road construction, agricultural practices, recreational and tourism, sand mining, quarrying and clay mining etc. community should play a regulatory role.

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE



NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE: pond ecosystem and
Food chains

NAME : SUMAN DAS
COLLEGE ROLL NO : HIUG / 020 / 19
DEPARTMENT : History Semester - 02
YEAR : 2020
SIGNATURE :

Pond Ecosystem and Food chains :

▷ ବ୍ୟକ୍ତିଗତ (Ecosystem) :

1935 ସାଲରେ ଅନ୍ତର୍ମିଳି ଏ. ଗୀ. ଟର୍ନ୍ସଲ୍ (A.G. Tansley) ବ୍ୟକ୍ତିଗତ ଏକ ଏକ୍ସିସ୍ଟମ୍ ହୁଏ । ଯିନି 'Eco' ଏକ ଅନୁଷ୍ଠାନିକ ପରିବାର ବ୍ୟକ୍ତିଗତ । ବିଜ୍ଞାନୀ ଡେମ୍‌ସ୍ଟେବ୍ରେ (Webster) 'System' ଏକ ବ୍ୟକ୍ତିଗତ ବ୍ୟକ୍ତିଗତ । ଯିନି ଛାତ୍ର, ଶ୍ରୀଚିତ୍ରି ବାଲ୍ମୀକୀୟ ପାଦମାର୍ଗରେ ଉପରେ ବିଶ୍ଵଭୂଷଣ ହୁଏ ଏଥିରେ ଆବଶ୍ୟକ ହୁଏ ।

▷ ବ୍ୟକ୍ତିଗତ ଅଧ୍ୟୟାତ୍ମକ (Definition of Ecosystem) :

ଅନ୍ତର୍ମିଳି ଓଡ଼େମ (Odum, 1971) ବ୍ୟକ୍ତିଗତ ବିଶ୍ଵଭୂଷଣ କୈତାନିକ ଦ୍ୱାରା
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ବ୍ୟକ୍ତିଗତ ପୋଡ଼ିମ ପରିବାର ଅଧିକ ବିଶ୍ଵଭୂଷଣ ବ୍ୟକ୍ତିଗତ
ବ୍ୟକ୍ତିଗତ ହେବାକୁ ବ୍ୟକ୍ତିଗତ, ଏହାଙ୍କ ବ୍ୟକ୍ତିଗତ ଏକ ପରିବାର ହେବାକୁ
ବ୍ୟକ୍ତିଗତ ବଳେ ।"

▷ ବ୍ୟକ୍ତିଗତ ଚାରିକର୍ତ୍ତା : (Characteristics of Ecosystem)

ବିଜ୍ଞାନୀ ଫିଲ୍ମ (Smith) 1974 ମୂଳେ ବ୍ୟକ୍ତିଗତ ବିଶ୍ଵଭୂଷଣ - କୈତାନିକ
ବ୍ୟକ୍ତିଗତ ହେବାକୁ ବ୍ୟକ୍ତିଗତ ବଳେ ।

1/ ବ୍ୟକ୍ତିଗତ ହେବ ବ୍ୟକ୍ତିଗତରେ ବ୍ୟକ୍ତିଗତ ହେବାକୁ ବ୍ୟକ୍ତିଗତ
ହେବ ଏହାକୁ ବ୍ୟକ୍ତିଗତ ହେବାକୁ ବ୍ୟକ୍ତିଗତ ହେବାକୁ ବ୍ୟକ୍ତିଗତ ହେବାକୁ ।

2/ ବ୍ୟକ୍ତିଗତ ପରିବାର ବିଶ୍ଵଭୂଷଣ ଏହାଙ୍କ ବ୍ୟକ୍ତିଗତ ବ୍ୟକ୍ତିଗତ ହେବାକୁ ।

3/ ନାୟକଙ୍କ ଜୀବି ପିମ୍ବାରେ ଅଭିଭାବ ଏବଂ ଉପରେ ଥିଲୁଗାରେ ଅଭିଭାବ ଏବଂ ଏହାର ନାୟକଙ୍କ ଜୀବି ପିମ୍ବାରେ ଅଭିଭାବ ଏବଂ ଏହାର ନାୟକଙ୍କ ଜୀବି ପିମ୍ବାରେ ଅଭିଭାବ ଏବଂ ଏହାର ନାୟକଙ୍କ ଜୀବି ପିମ୍ବାରେ ଅଭିଭାବ ।

4/ ନାୟକଙ୍କ ଜୀବି ପିମ୍ବାରେ ଅଭିଭାବ ଏବଂ ଏହାର ନାୟକଙ୍କ ଜୀବି ପିମ୍ବାରେ ଅଭିଭାବ ଏବଂ ଏହାର ନାୟକଙ୍କ ଜୀବି ।

5/ ଅଭିଭାବ ଏବଂ ଏହାର ନାୟକଙ୍କ ଜୀବି ପିମ୍ବାରେ ଅଭିଭାବ ଏବଂ ଏହାର ନାୟକଙ୍କ ଜୀବି ପିମ୍ବାରେ ଅଭିଭାବ ଏବଂ ଏହାର ନାୟକଙ୍କ ଜୀବି ପିମ୍ବାରେ ଅଭିଭାବ ।

► ଝାରାର ନାୟକଙ୍କ : (Pond Ecosystem)

ପାଶିବଳ୍ୟ ଅବଶ୍ୟକ ଏବଂ ଏହା କୌଣସିତାରେ ଉପରେ ଅଭିଭାବ ଏବଂ ଏହାର ନାୟକଙ୍କ ଜୀବି ପିମ୍ବାରେ ଅଭିଭାବ ଏବଂ ଏହାର ନାୟକଙ୍କ ଜୀବି ପିମ୍ବାରେ ଅଭିଭାବ ଏବଂ ଏହାର ନାୟକଙ୍କ ଜୀବି ପିମ୍ବାରେ ଅଭିଭାବ (Cerenberg, 1973) ଅଧିକ ପ୍ରକାଶିତ କରିଛନ୍ତି । କିମ୍ବାର ପାଶିବଳ୍ୟ ଏବଂ ଏହାର ନାୟକଙ୍କ ଜୀବି ପିମ୍ବାରେ ଅଭିଭାବ ।

ପାଶିବଳ୍ୟ ଏବଂ ଏହାର ନାୟକଙ୍କ ଜୀବି ପିମ୍ବାରେ ଅଭିଭାବ ।

▷ ଅର୍ଥାତ୍ କେଳାର :

ଲାଲ, ହାତ, ମୁଖ୍ୟ ପାଦ, ଉଦ୍‌ଦେଶ୍ୟ, ମଧ୍ୟ, କାନ୍ଦିନ୍,
ଚକ୍ରମଳୀର, କାନ୍ଦିନ୍, କାନ୍ଦିନ୍ ଏହିର କେଳାର ଦ୍ୱାରା ।

▷ ଫିର କେଳାର :

ଦେବ କେଳାରରେ ରୂପରେ ଯେବେ କାନ୍ଦିନ୍ ଏହିର
-

କୁ କେଳାର :

ରୂପରେ କୁକୁରରେ କୁକୁରର ବିଭିନ୍ନ ଅନ୍ତର୍ଭାବରେ ଏ କୁକୁରର
ରୂପ (କୋଣ - କାନ୍ଦିନ୍, କାନ୍ଦିନ୍, କାନ୍ଦିନ୍ ଏହିର କୁକୁରର ରୂପରେ
କୁକୁର) ।

କୁ ଅନ୍ତର୍ଭାବ କୁକୁର :

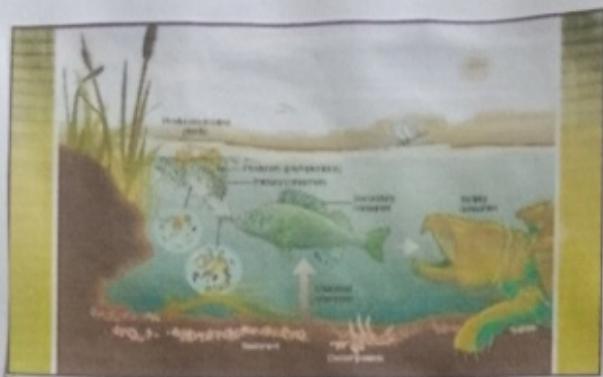
କୁକୁର ଲାଲ୍, କୁକୁର କେଳାର କେଳାର ଅଳକଟାଣି,
କେଳାର କୁକୁର ଲାଲ୍ ଅଛନ୍ତି ଅନ୍ତର୍ଭାବ କୁକୁର କୁକୁର । କେଳାର
କୁକୁର ଅନ୍ତର୍ଭାବ କୁକୁରରେ କୁକୁର । ଦେବ କୁକୁର କୁକୁର - କୁକୁର
କୁକୁର ଲାଲ୍, କାନ୍ଦିନ୍ କୁକୁରରେ କୁକୁର - କୁକୁର କୁକୁର କୁକୁର,

କୁ କିମ୍ବା କୁକୁର କୁକୁର :

କୁକୁର କୁକୁର କୁକୁର, କୁକୁର ଅଳକ ମାଲି - କାନ୍ଦିନ୍,
କାନ୍ଦିନ୍ ଅଛନ୍ତି କିମ୍ବା କୁକୁର କୁକୁର । ଦେବ କୁକୁର କୁକୁର କୁକୁର କୁକୁର
କୁକୁର କୁକୁର କୁକୁର କୁକୁର କୁକୁର କୁକୁର କୁକୁର
କାନ୍ଦିନ୍ କାନ୍ଦିନ୍ କାନ୍ଦିନ୍ କାନ୍ଦିନ୍ । କାନ୍ଦିନ୍ ଦେବ କୁକୁର କୁକୁର
କୁକୁର କୁକୁର କୁକୁର କୁକୁର ।

କୁ କିମ୍ବା କୁକୁର :

କିମ୍ବା କିମ୍ବା କିମ୍ବା କିମ୍ବା କିମ୍ବା କିମ୍ବା କିମ୍ବା
କିମ୍ବା କିମ୍ବା କିମ୍ବା କିମ୍ବା କିମ୍ବା କିମ୍ବା କିମ୍ବା
(କାନ୍ଦିନ୍, କାନ୍ଦିନ୍ ଏହିର) କାନ୍ଦିନ୍, କାନ୍ଦିନ୍, କାନ୍ଦିନ୍, ଏହିର କିମ୍ବା
କିମ୍ବା ।



ଶ୍ରୀକୃତିବ ବାନ୍ଧୁତଥ

▷ क्षितिजपत्र

ମୁଣ୍ଡାରୀର ଶୁଣିଲ୍ପ କିମ୍ବା ଏହାରେ ଉଦ୍‌ଦେଶ୍ୟ ଅଧିକ ବିଭାଗରେ ।
ଏହା ଉଦ୍‌ଦେଶ୍ୟ ଅଳ୍ପ କଥାରୁ ବାଜ ହେଉ । ବିଭାଗରୁଙ୍କାଲା କିମ୍ବାରୁ କଥାରୁ
ମୁଣ୍ଡାରୀର ଏହା କାହିଁମୁଁ କରିଲ ଯୋଗରୁ ତଥାଲା କିମ୍ବାରୁ
କଥାରୁ ହେବାରୁ ହେବା । ଏହା ବିଭାଗରୁ କିମ୍ବାରୁଙ୍କାଲା କଥାରୁ ମୁଣ୍ଡାରୀ
କଥାରୁ କଥାରୁ କଥାରୁ । ଏହା ବିଭାଗରୁ କିମ୍ବାରୁଙ୍କାଲା କଥାରୁ ମୁଣ୍ଡାରୀ
କଥାରୁ କଥାରୁ କଥାରୁ ।

四

sm) *mycor*: (Food chains)

ମୁଖ୍ୟ ପରିକାଳର ଉତ୍ସବ କାହାର ଲିଖିତ ଅନ୍ଧାଳୀତ ରୂପରେ
ଗାୟିକ ଦିଶାମୁଖ କାହାର ଲୋକ ଦୁଃଖକାନ୍ଦିନୀ ଏବଂ କୌଣସିବୀର
ଜ୍ଞାନ ପ୍ରାପ୍ତିତ ବୁଝିବା ଆପଣଙ୍କ ପରିଚାରକଙ୍କରେ ଯାଇବା
ପାଇଲା । ବିଜେତା ପରା - (Editor) 1966 ରେଖା ପାଠ୍ୟକାନ୍ଦିନୀ ପରିଚାରକଙ୍କରେ
ବିଜେତାମିତିରେ ବ୍ୟାପକ ପ୍ରାପ୍ତି ବୁଝିବା -

390437: (Definition)

"(୨) ଅଭିଭୂତ ପାର୍ଶ୍ଵକୁ ଦିଇଲୁଗରୁ ମାରୁ ଉତ୍ସମ୍ଭବରୁ ଯଦିବୁ ୧
ଏହାରେ ବ୍ୟାକୁରିତି ବିଳିଲୁ ବିଳିଲୁ ଥାବୀଜେଣ୍ଟିରୁ କୃତ ଅବାହିତ କୁମ୍ବ,
ରୁହ ଅବାହିତ ପ୍ରମଧରୁ ବ୍ୟାକୁରିତି ପାର୍ଶ୍ଵକୁ ଦିଇଲୁଗରୁ କୁମ୍ବ,
ଏହୁ-ଅବାହିତ କେବିତ ଦିଇଲୁଗରୁ ପାର୍ଶ୍ଵକୁ ଦିଇଲୁଗରୁ କୁମ୍ବ ।
ଥାବୀରୁ ପାର୍ଶ୍ଵକୁ ରୁହ ଅବାହିତ କେବିତ ଦିଇଲୁଗରୁ କୁମ୍ବ ।

ଏ ପ୍ରତି ଜୀବଙ୍କାର, ଯୁଦ୍ଧ କାର୍ଯ୍ୟର କୁଟୁମ୍ବ, ବିଶେଷ କାର୍ଯ୍ୟର କୁଟୁମ୍ବ, କୃତିକାର୍ଯ୍ୟର କୁଟୁମ୍ବ, କୃତିକାର୍ଯ୍ୟର ଅନ୍ତର୍ଭାବର ବିଶେଷ କାର୍ଯ୍ୟର କୁଟୁମ୍ବ ଏବଂ କାର୍ଯ୍ୟର କୁଟୁମ୍ବର କୁଟୁମ୍ବ ।

▷ ଖାଦ୍ୟ କ୍ରମିକ ଜୀବଙ୍କାର ଗଠିତ ହୁଏ (How the food chains are formed)

କିମ୍ବାର ଖାଦ୍ୟ କ୍ରମିକ ଜୀବଙ୍କାର ଗଠିତ ହୁଏ କୌଣସିଲାଇର ଏବଂ କୌଣସିଲାଇର କୁଟୁମ୍ବ କୁଟୁମ୍ବ । ଏହି କୁଣ୍ଡଳମାତାଙ୍କର ଆବଶ୍ୟକ ଖାଦ୍ୟ କୁଟୁମ୍ବ ଏବଂ କୁଣ୍ଡଳମାତାଙ୍କର କୁଟୁମ୍ବ କୋଣାରକ କାର୍ଯ୍ୟ । ଯୁଦ୍ଧକାର୍ଯ୍ୟର କୁଟୁମ୍ବ ଏବଂ ଯୁଦ୍ଧକାର୍ଯ୍ୟର କୁଟୁମ୍ବ କୁଟୁମ୍ବ ଏବଂ ଯୁଦ୍ଧକାର୍ଯ୍ୟର କୁଟୁମ୍ବ ଏବଂ ଯୁଦ୍ଧକାର୍ଯ୍ୟର କୁଟୁମ୍ବ । ଏହି କୁଣ୍ଡଳମାତାଙ୍କର ଆବଶ୍ୟକ ଖାଦ୍ୟର କୁଟୁମ୍ବ, ଏହି କୁଣ୍ଡଳମାତାଙ୍କର ଆବଶ୍ୟକ ଖାଦ୍ୟର କୁଟୁମ୍ବ, ଏହି କୁଣ୍ଡଳମାତାଙ୍କର ଆବଶ୍ୟକ ଖାଦ୍ୟର କୁଟୁମ୍ବ । ଏହି କୁଣ୍ଡଳମାତାଙ୍କର ଆବଶ୍ୟକ ଖାଦ୍ୟର କୁଟୁମ୍ବ, ଏହି କୁଣ୍ଡଳମାତାଙ୍କର ଆବଶ୍ୟକ ଖାଦ୍ୟର କୁଟୁମ୍ବ, ଏହି କୁଣ୍ଡଳମାତାଙ୍କର ଆବଶ୍ୟକ ଖାଦ୍ୟର କୁଟୁମ୍ବ । ଏହି କୁଣ୍ଡଳମାତାଙ୍କର ଆବଶ୍ୟକ ଖାଦ୍ୟର କୁଟୁମ୍ବ, ଏହି କୁଣ୍ଡଳମାତାଙ୍କର ଆବଶ୍ୟକ ଖାଦ୍ୟର କୁଟୁମ୍ବ, ଏହି କୁଣ୍ଡଳମାତାଙ୍କର ଆବଶ୍ୟକ ଖାଦ୍ୟର କୁଟୁମ୍ବ । ଏହି କୁଣ୍ଡଳମାତାଙ୍କର ଆବଶ୍ୟକ ଖାଦ୍ୟର କୁଟୁମ୍ବ, ଏହି କୁଣ୍ଡଳମାତାଙ୍କର ଆବଶ୍ୟକ ଖାଦ୍ୟର କୁଟୁମ୍ବ, ଏହି କୁଣ୍ଡଳମାତାଙ୍କର ଆବଶ୍ୟକ ଖାଦ୍ୟର କୁଟୁମ୍ବ ।

କୁଣ୍ଡଳମାତାଙ୍କର କ୍ରମିକ:

କୁଣ୍ଡଳ କ୍ରମିକ - ଝାଲିଯାନ୍ତା - ଛାନ୍ଦି ଖାଦ୍ୟ - କାଣ୍ଡା ଖାଦ୍ୟ
(କୁଣ୍ଡଳମାତାଙ୍କର) (କୁଣ୍ଡଳମାତାଙ୍କର) (କୁଣ୍ଡଳମାତାଙ୍କର) (କୁଣ୍ଡଳମାତାଙ୍କର)

ଯୁଦ୍ଧକାର୍ଯ୍ୟ କ୍ରମିକ:

ଯୁଦ୍ଧକାର୍ଯ୍ୟ - କାର୍ଯ୍ୟକାରୀ - ଯୁଦ୍ଧ - ଯୁଦ୍ଧ - ଯୁଦ୍ଧ - ଯୁଦ୍ଧ
(ଯୁଦ୍ଧକାର୍ଯ୍ୟ) (ଯୁଦ୍ଧକାର୍ଯ୍ୟ) (ଯୁଦ୍ଧକାର୍ଯ୍ୟ) (ଯୁଦ୍ଧକାର୍ଯ୍ୟ) (ଯୁଦ୍ଧକାର୍ଯ୍ୟ)

» ମୁଖ୍ୟ ଅନ୍ତର୍ଭାବ ଧରନିକାରୀ :-

ଯାହାଙ୍କୁ ବିଶେଷ ପରିପ୍ରେକ୍ଷଣ କରିବାକୁ ପାଇଁ ।

ଏହାର - ଅନ୍ତର୍ଭାବ, ଅନ୍ତର୍ଭାବ, କାହାର ମୁଖ୍ୟ ଅନ୍ତର୍ଭାବ ।

ଏହାର ଅନ୍ତର୍ଭାବ ମୁଖ୍ୟ ଅନ୍ତର୍ଭାବ ।

» ୩୦°-୪୫° :-

(୧) ମୁଖ୍ୟ ଅନ୍ତର୍ଭାବ କିମ୍ବା ମୋରେ ଜୁଦା କଥା କଥା କଥା କଥା କଥା
କଥା କଥା କଥା କଥା କଥା କଥା କଥା କଥା କଥା କଥା କଥା କଥା

» ଅନ୍ତର୍ଭାବ ମୁଖ୍ୟ ଅନ୍ତର୍ଭାବ କିମ୍ବା

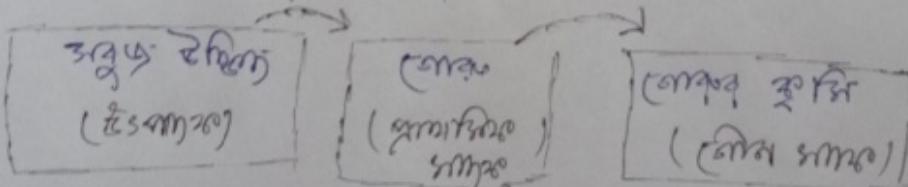
(୧) ଅନ୍ତର୍ଭାବ ମୁଖ୍ୟ ଅନ୍ତର୍ଭାବ କଥା କଥା କଥା
କଥା କଥା କଥା କଥା । (୨) ଏହା ମୁଖ୍ୟ ଅନ୍ତର୍ଭାବ କଥା କଥା କଥା କଥା ।
(୩) କ୍ଷେତ୍ରର କ୍ଷେତ୍ର ପ୍ରାଚୀନ ଆଳକାର କଥା କଥା କଥା । (୪) ଏହା ମୁଖ୍ୟ
କଥା କଥା । ଅନ୍ତର୍ଭାବ କଥା କଥା କଥା କଥା । (୫) ଏହା ମୁଖ୍ୟ
କଥା କଥା କଥା କଥା କଥା କଥା ।

» ଅନ୍ତର୍ଭାବ ମୁଖ୍ୟ ଅନ୍ତର୍ଭାବ କିମ୍ବା

କଥା କଥା କଥା କଥା କଥା

କଥା କଥା କଥା କଥା କଥା

କଥା କଥା କଥା କଥା



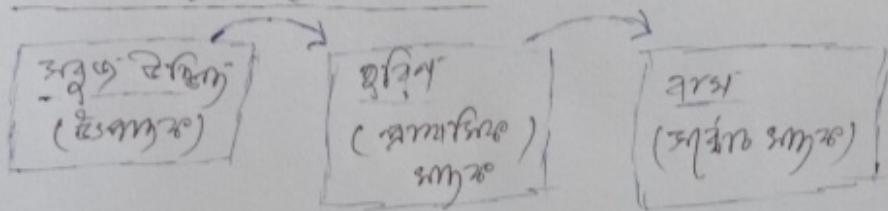
» ଅନ୍ତର୍ଭାବ ମୁଖ୍ୟ ଅନ୍ତର୍ଭାବ :-

(୧) ମୁଖ୍ୟ ଅନ୍ତର୍ଭାବ କିମ୍ବା ମୋରେ କଥା କଥା କଥା କଥା
କଥା (କିମ୍ବା କଥା କଥା କଥା କଥା), କଥା, କଥା, କଥା, କଥା, କଥା, କଥା,
(କଥା କଥା କଥା କଥା କଥା କଥା), କଥା, କଥା, କଥା, କଥା, କଥା, କଥା,
କଥା ।

» କବିତାକୁ ଆହୁତିରେ ଦେଖିବା:

- » ଶ୍ରୀକିଶୋର ଓ ମେ ପରିଚୟ ଅବସ୍ଥା
ଆହୁତିର ଲଭ୍ୟରେ ଯଦି ଆହୁତିର ଜୀବନରେ କୌଣସି ହେଲା
ଏହା ଆହୁତିର ପ୍ରଗମନକାରୀ ଛାତ୍ର, କାଳେ କିମ୍ବା ଏହାରେ ବେଳେ
ଏହା ଏ ଏହି ଆହୁତିର, କେବଳ ଏହାର ଫୁଲ ଥିଲା ଏହାର
ପ୍ରାଣରେ, କୌଣସି ଏ ଏହାର ବୁଝିବା ଆହୁତିର କାହାରେ ଏହାର
ଏ ଏହି ଆହୁତିରେ କେବଳରେ ଆହୁତିର କାହାରେ ଏହାର ।

» କବିତାକୁ ଆହୁତିରେ ପରିଚୟ:



ବିଷୟ ଆହୁତିର ଏ ପରିଚୟ ଆହୁତିର:

ଏ ଆହୁତିର ପରିଚୟ ଅବସ୍ଥା-

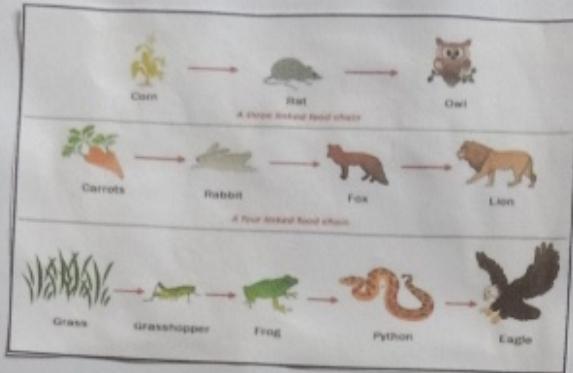
କବିତାର ଲଭ୍ୟରେ କୈବଳ୍ୟ ଏ କବିତା କୋଣର ଆହୁତି ଆହୁତିର
ବ୍ୟାପରେ ଏହାର ପ୍ରକାଶ କରିବାର କୋଣର ଏହାର କବିତାର
ବ୍ୟାପର ଆହୁତିର ଏ ପ୍ରକାଶ ଆହୁତିର ଏହା ।

» କବିତାକୁ ଆହୁତିରେ ଦେଖିବା:

ବିଭିନ୍ନ ପ୍ରକାଶ ପାତ୍ରରେ ଆହୁତିର ଅଧିକ ବିଭିନ୍ନ ବିଭିନ୍ନ କାହାର
ବିଭିନ୍ନ କାହାର ଲଭ୍ୟରେ କୈବଳ୍ୟରେ ବିଭିନ୍ନ କାହାର ।
ଏ ଏହି ବିଭିନ୍ନ କାହାର ଏହାର କାହାର କାହାର କାହାର
ଆହୁତିର କାହାର କାହାର । ଏହାର ଏହାର ଏହାର ଏହାର
ଏହାର ଏହାର ଏହାର ଏହାର । ଏ ଏହି ପ୍ରକାଶ ଆହୁତିର
ବିଭିନ୍ନ କାହାର କାହାର ଏହାର । ଏ କବିତାକୁ ଆହୁତିର
ଏହି କାହାର ଏହାର ଏହାର ଏହାର ଏହାର ଏହାର । ଏହାର
ଏହାର ଏହାର ଏହାର ଏହାର ।

» କଣ୍ଟ ଶାସ୍ତ୍ରଜୀବିଜ୍ଞାନ ବିଷୟ:

ପଦମୂଳ ଜାଗ → ପରିପାଳନ → ଜାଗ ଜାଗ → ଜାଗ ଜାଗ →
→ ଜାଗ ଜାଗ ।



Food chains

ଉଦ୍ଦେଶ୍ୟ କୁଣ୍ଡଳ ବା ଉପରିକାଳୀନ:

- 1/ ଶାସ୍ତ୍ରଜୀବିଜ୍ଞାନ ଜାଗରୁକ କାର୍ଯ୍ୟକ୍ରମ ଆବଶ୍ୟକ (Energy flow). କିମ୍ବା କାର୍ଯ୍ୟକ୍ରମ କିମ୍ବା ପରିପାଳନ କାର୍ଯ୍ୟକ୍ରମ ।
- 2/ ଶାସ୍ତ୍ରଜୀବିଜ୍ଞାନ କାର୍ଯ୍ୟକ୍ରମ ବିଭିନ୍ନ ଫୋର୍ମରେ ପରିପାଳନ କାର୍ଯ୍ୟକ୍ରମ ।
- 3/ ଶାସ୍ତ୍ରଜୀବିଜ୍ଞାନ କାର୍ଯ୍ୟକ୍ରମ କୌଣସିକାର୍ଯ୍ୟ ବିଭିନ୍ନ ଫୋର୍ମରେ ପରିପାଳନ କାର୍ଯ୍ୟକ୍ରମ ।
- 4/ ଶାସ୍ତ୍ରଜୀବିଜ୍ଞାନ କାର୍ଯ୍ୟକ୍ରମ କାର୍ଯ୍ୟକ୍ରମ କାର୍ଯ୍ୟକ୍ରମ କାର୍ଯ୍ୟକ୍ରମ କାର୍ଯ୍ୟକ୍ରମ କାର୍ଯ୍ୟକ୍ରମ ।

ଶୁଦ୍ଧିତ ପାତ୍ରରେ ୩ ମାତ୍ରାକ୍ଷରଣ ହେଲା (ସବୁ ଓହିବାରେ)

બાળસ્કૃતિકા:

"ઓફ ગ્રામ લાર કાર્પાડ ને અભિવૃત કરો"
- અંતરાણ હાઈ

અધ્યાત્મન અનુભૂતિની પ્રીતિ મુજબ વેદિયે આવ્યે હશે એવી અધ્યાત્મ
ના અનુભૂતિની પ્રીતિ વિશે જીવની અનુભૂતિ કેવી રીતે હશે ?
'અધ્યાત્મ': અધ્યાત્મની અનુભૂતિ કેવી અનુભૂતિ હોય ?
ગ્રામીય લિખિત લાંબી મુજબ - એવી અનુભૂતિ કેવી ?
અને મુજબની વિશે જોકાં એવી અનુભૂતિ હોય ,
" મુજબની અનુભૂતિ જીવી જીવી એવી અનુભૂતિ હોય .
પણ તે અનુભૂતિ , એવી અનુભૂતિ એવી અનુભૂતિ .
અનુભૂતનીની સૌથી !

Margaret Mead'-ની અનુભૂતિ,

"Never doubt that a small group
of thoughtful, committed citizens can change the world; indeed,
it is the only thing that ever has"

લિખાનાન્દિકા:

1/ ચિત્રાંકિત, ગ્રામીય : અભિવૃત (અનુભૂતિ કરી અનુભૂતિ કરી, 2028)

2/ DR. ASTHANA, D.K., DR. ASTHANA, MEERA : A Textbook of
Environmental Studies.

ଶୁଣେଥିବା:

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କୁହାରକୁଳୀ

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE



NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE:

Air Pollution in Cities and Measures to Control It

NAME : Sunil Das.

COLLEGE ROLL NO : CHUG/208/19

DEPARTMENT : Chemistry

YEAR : 2020

SIGNATURE : Sunil Das.

Air Pollution in Cities and Measures to Control It =

■ Introduction :

It is the occurrence of or presence of any material, chemical, particulates or biological materials in such a high concentration that causes discomfort, disease or death to humans, damage other living organisms such as food crops, or damage natural environment or built environment.

A substance or factors in the air that can be adverse to humans and environment is known as an air pollutant. Pollutants can be in the form of solid particles, liquid droplets, or gases. In addition, they may be natural or man-made. Pollutants can be as primary or secondary. Usually primary pollutants are directly produced from a process, such as ash from a volcanic eruption, the carbon monoxide gas from a motor vehicle exhaust or sulphur dioxide released from factories. Secondary pollutants are not emitted directly. Rather, they form in the air when primary react or interact. An important example of a secondary is ground level ozone - one of the many secondary pollutants that make up photochemical smog. Some pollutants may be both primary and secondary; that is, they are both emitted directly and from other primary pollutants.

According to Central Pollution Control Board (CPCB) particulate size $2.5\text{ }\mu\text{m}$ or less than in diameter are responsible for causing the greatest harm to human health.

Major primary pollutants produced by human activities include:

- Sulphur Oxides (SO_x) - Especially sulphur dioxide, a chemical compound with the formula SO_2 . SO_2 is produced by volcanic eruptions and in various industrial processes. Since coal and petroleum often contain sulphur compounds, their combustion generates SO_2 . Further oxidation of SO_2 , usually in presence of a catalyst such as NO_2 , forms H_2SO_4 , and thus acid rain. This is one of the causes for concern over the environmental impact of the use of these fuels as power sources.
- Nitrogen Oxides (NO_x) - Especially nitrogen dioxide are expelled from high temp. Combustion, and are also produced naturally during thunderstorms by electric discharge. Can be seen as the brown haze dome above or plume downwind of cities. NO_2 is one of the several nitrogen oxides which is a reddish-brown toxic gas and has a characteristic sharp, biting odor. NO_2 is one of the most prominent air pollutants.
- Carbon monoxide (CO) - It is a colourless, odourless, non-irritating but very poisonous gas. It is a product by incomplete combustion of fuel such as natural gas, coal or wood. Vehicular exhaust is a major source of CO .

■ Cause: Factors Responsible for Air Pollution :

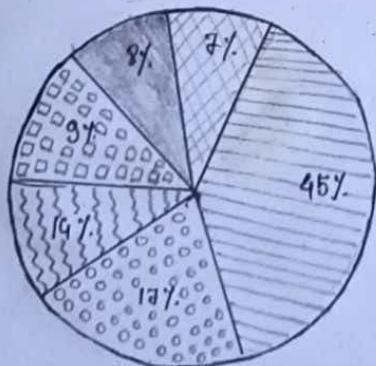
Air pollution can result from both human and natural actions. Natural events that pollute the air include forest fires, volcanic eruptions, wind erosion, pollen dispersal, evaporation of organic compounds and natural radioactivity. Sources of air pollution refer to the various locations, activities or factors which are responsible for the releasing of pollutants into the atmosphere.

Man-made sources mostly related to burning different kinds of fuel.

- "Stationary Sources" include smoke stacks of power plants, manufacturing facilities and waste incinerators, as well as furnaces and other type of fuel-burning heating devices. In developing and poor countries, traditional biomass burning is the major source of air pollutants; traditional biomass includes wood, crop and dung.
- "Mobile Sources" ~~that~~ includes motor vehicles, marine vessels, aircraft and effect of sound etc.
- Chemicals, dust and controlled burn practices in agriculture and forestry management. Controlled or prescribed burning is a technique sometimes used in forest management, farming, prairie restoration or greenhouse gas abatement. Fire is a natural part of both forest and grassland ecology and controlled fire can be a tool for foresters. Controlled burning stimulates the germination of some desirable forest trees, thus renewing the forest.
- fumes from paint, hair spray, varnish, aerosol sprays and other solvents.

Natural Sources =

- Dust from natural sources, usually large areas of land with few or no vegetations.
- Methane, emitted by the degradation of food by animals; for example cattle.
- Smoke and carbon monoxide from wild fires.
- Vegetation, in some regions, emits environmentally friendly amount of VOCs on warmer days. These VOCs react with primary anthropogenic pollutants - specifically NO_x, SO₂, and anthropogenic organic compounds - to produce a seasonal haze of secondary pollutants.
- Volcanic activity, which produce sulphur, chlorine and ash particulates.



- 45% - Dust and Construction
- 17% - Waste burning
- 17% - Transport
- 14% - Diesel Generators
- 9% - Industries
- 7% - Domestic Cookings

Air Pollution in Indian Cities:

Air pollution in India is a serious health issue. Of the most polluted cities in the world 21 out of 30 were in India in 2019. As per a study based on 2016 data, at least 140 million people in India breath air that is 10 times or more over the WHO safe line. And 13 of the world's 20 cities with the highest annual levels of air pollution are in India. The 51% of pollution is caused by the industrial pollution, 23% by vehicles, 17% by crop burning and only 8% by fireworks. Air pollution contributes to the premature death of 2 million Indians every year. Emissions come from vehicles and industry, whereas in rural areas, much of the pollution stems from biomass burning for cooking and keeping warm. In autumn and winter months, large scale crop residue burning in agriculture fields - a cheaper alternative to mechanical tilling - is a major source of smoke, smog and particulate pollution. India has a low per capita emission of greenhouse gases but the country as a whole is the third largest greenhouse gas producer after China and the United States. A 2013 study on non-smokers has found that have 30% weaker lung function than Europeans.

Delhi leads among the countries of India in case of air pollution. It has more cars than states of West Bengal and Gujarat put together. In 1990's Delhi ranked 4th among the 41 most polluted cities all over the world.

Consequences : Effect of Air Pollution :

Health Effect: Air pollution is a significant risk factor for multiple health conditions including heart disease and lung cancer, according to the WHO. The health effects caused by air pollution may include difficulty in breathing, wheezing, coughing, asthma and aggravation of existing respiratory and cardiac conditions. These effects can result in increased medication use, increased doctor or emergency room visits, more hospital admission and premature death. The human health effects of poor air quality are far-reaching, but principally affects the body's respiratory system and cardiovascular system. Individual reactions to air pollutants depend on the type of pollutant a person is exposed to, the degree of exposure, the individual's health and genetics.

Environmental Effect: Poisonous air pollutants (toxic chemicals in air) can form acid rain. It can also form dangerous ground level ozone. These destroys trees, crops, farms, animals and continue to make water bodies harmful to humans and animals that live and depend on water.

Economical Effect: The effect of air pollution on the economy may be a derived one. In simple language, the economy thrives when people are healthy, and business that depends on cultivated raw materials and natural resources are running at full efficiency. Air pollution reduces agricultural crop and commercial forest yields by billions of money each year. This in addition to people staying off work for health reasons can costs the economy greatly.

Pollutants	Source	Effects
1. Aerosols [Vapour chemicals in the form of fluorocarbons, CFC, SO_2 , NO_2 , NO etc]	G) Emissions of jet and supersonic aeroplanes. G) Refrigerators and air conditioners use aerosols (CF_2Cl_2) as refrigerant.	Causes Ozone (O_3) depletion.
2. Smoke (Visible suspension of carbon)	The power stations throw out large amount of fly ashes.	Causes respiratory problems like asthma and bronchitis in humans.
3. Dust and mists	Both are released from industries	Causes Pneumonia, Asbestosis, Silicosis etc.

Measures to Control Air Pollution:

Solution effort on pollution are always a big problem. This is why prevention intervention are always better way of controlling air pollution. These prevention methods can either come from government or by individual actions. In many big cities, monitoring equipments have been installed at many points in the city.

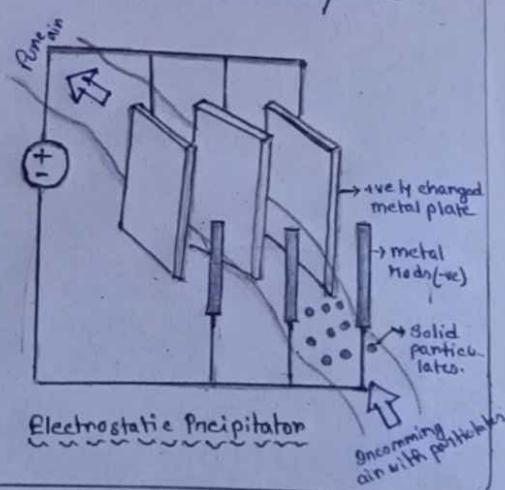
Individual Level Prevention: • Encourage your family to use the bus, train or bikes when commuting. If we all do this, there will be fewer cars on road and less fumes.

• Use energy wisely. This is because lots of fossil fuels are burned to generate electricity, and so if we can cut down the use, we will also cut down the pollution we create.

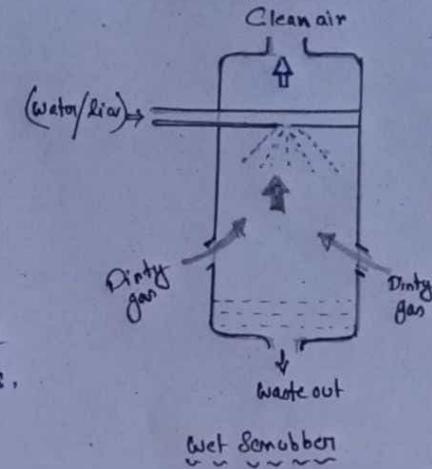
• Recycle and re-use things. This will minimize the dependence of producing new things. Remember manufacturing industries create a lot of pollution, so if we can re-use things like shopping plastic bags, clothing, paper and bottles, it can help.

Control Devices: The following items are commonly used as pollution control devices by industries or transportation devices. They ~~can~~ can either destroy contaminants or remove them from an exhaust stream before it is emitted into the atmosphere.

Electrostatic Precipitator: An electrostatic precipitator or electrostatic air cleaner is a particulate collection device that removes particles from a flowing gas using the force of an induced electrostatic charge. It is highly efficient filtration device that can remove fine particles like dust and smoke from the air stream.



Particulate Scrubber or Wet scrubber is a form of pollution control technology. The term describes a variety of devices that remove pollutants from a furnace flue gas or from other gases. In a wet scrubber, the polluted gas stream is brought into contact with the scrubbing liquid, by spraying it with the liquid, by forcing it through a pool of liquid, or by some other contact method, so as to remove the pollutants.



Government Level Prevention:

The Govt. of India through a new auto fuel policy has laid out a roadmap to cut down vehicular pollution in Indian cities. More stringent norms for fuels means steadily reducing the sulphur and aromatic content in petrol and diesel fuels.

- On April 29, 1999 the supreme court of India ruled that all vehicles in India have to meet Euro-I.
- India 2000 norms by June 1.
- Euro-II in the NCR by April, 2000
- Euro-III norms, stipulate that sulphur should be controlled at 350 ppm in diesel and 150 ppm in petrol. Aromatic hydrocarbons are to be contained at 92% of the concerned fuel.
- Bharat Stage IV fuels contain 50 ppm sulphur. The BSIV norms had been enforced across the country since April, 2017.
- Use of unleaded petrol, low sulphur petrol and diesel, catalytic converters in vehicles.
- In 2016, the central had announced that the country would skip the BSV norms altogether and adopt BSVI by 2020.
- The BSVI fuel is estimated to bring around an 80% reduction of sulphur from 50 ppm to 10 ppm.

Conclusion:

Air pollution can be prevented only if individuals and businesses stop using toxic substances that cause air pollution. This would mean the cessation of all fossil fuel-burning processes, from industrial manufacturing to home use of air conditioners. This is an unlikely scenario at this time. However, we have to make rules which set stringent regulations on industrial and power supply manufacturing and handling. The regulations are to be designed to be forthright to reduce harmful emissions into the Earth's atmosphere.

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE



NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE:

Water pollution and measures to control it.

NAME : SUPRIYA PRADHAN
COLLEGE ROLL NO : CHUGI/040119
DEPARTMENT : CHEMISTRY
YEAR : 2020
SIGNATURE : Supriya pradhan

■ Introduction :

British poet W.H Auden once noted, 'Thousands have lived without love, not one without water.' John Todd said, 'our liquid planet glows like a soft blue sapphire in the hard-edged darkness of space. There is nothing else like it in the solar system. It is because of water.'

Water is the essential element that makes life on earth possible. It flows from our taps when they are turned on and we remained complete carefree about that. Like good health we ignore water when we have it.

The widespread problem of water pollution is jeopardizing our health. Unsafe water kills more people each year than war. Meanwhile, our drinkable water sources are finite i.e less than 1%. Of the earth's fresh water sources are finite i.e. less than 1% of the earth's fresh water is actually accessible to us. When global demand for freshwater is expected to be one-third greater than it is now.

Still, we are not hopeless against the threat to clean water. To better understand the problem, here we will discuss about an overview of what water pollution is, what causes it and how we can prevent it.

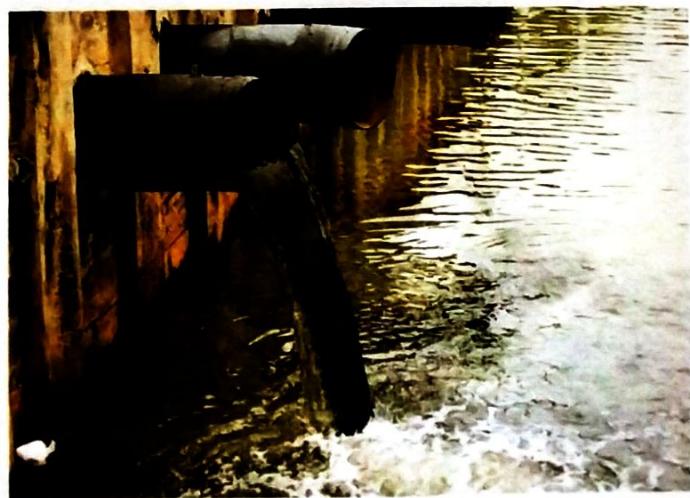
Q What is water pollution?

Water pollution occurs when harmful substances often chemicals or microorganisms - contaminate a stream, river, lake, ocean, aquifer or any other waterbody, degrading water quality and rendering it toxic to humans and to the environment.

Q Types of sources of water pollution:

① Point Source :- When contamination occurs from a single source and that source can be readily identified as it has a definite place where it enters water, then that source is called as point source.

Examples :- Municipal and industrial discharge pipes, waste under water discharged from a manufacturing unit, oil refinery etc.



① Non-point Source :-

Non-point source of pollution is the opposite of point source pollution, with pollutants released in a wide area. Non-point source of pollution is harder to identify and harder to address. It is pollution that comes from many places all at once.

Example:-

Picture a city street during a thunderstorm. As rainwater flows over asphalt, it washes away drops of oil that leaked from car engines, particles of tire rubber, clay wash and trash.

Also in urban area, people use water from a definite waterbody (Pond, river etc) in many purposes and also various chemicals mixed with that waterbody from the agricultural field.



- ② The pollution from non-point source is very difficult to regulate, since there is no single, identifiable culprit.

Different categories of water pollution :-

Groundwater pollution :-

Groundwater is one of our least visible but most critical natural resources. With rainfall, it becomes groundwater as it seeps deep into the earth, filling up rocks which is an underground storehouse of water.

Groundwater gets polluted when contaminants such as fertilizers, pesticides and waste leaching from landfills and specific systems, making their way into an aquifer.

Surface water pollution :-

Surface water covers about 70% of the earth, filling our oceans, lakes, rivers and including all blue bits in the world map. Surface water form fresh water surfaces other than sea accounts for more than 60% of the water delivered to our homes.

Nutrient pollution than includes nitrates and phosphates which plants and animals need to grow causes major pollution in the freshwater sources. Municipal and industrial waste discharges and also individually dumping directly into waterways contribute their fair share of toxins.

As per the environmental protection agency of U.S. nearly 50% of our rivers, streams, ~~the~~ one third of our lakes and ponds are polluted and unfit for swimming, fishing and drinking.

⑧ Ocean water pollution: 80% of ocean pollution or marine pollution originates on land along the coast or far inland. Streams and rivers carry contaminants such as chemicals, nutrients and heavy metals that are carried from farms, factories and cities into our bays and estuaries and from there finally they reach the ocean.

Marine debris, particularly plastic is blown away by the wind or washed away in storm via drains and sewers. The ocean absorbs a quarter of human made carbon.

⑨ Transboundary → A boundary line cannot contain water pollution on a map. Transboundary pollution happened when contaminated waste from one country spilled into other countries waters. It can result from a disaster like an oil spill or the slow, downriver creep of industrial or municipal discharge.



IV causes and effects of water pollution :-

① Sewage and domestic waste :-

Nearly 75% of water pollution is due to sewage and domestic wastes. A mere 1% impurities make domestic sewage unfit for human use. Sewage generally includes biodegradable

Pollutants like human and animal's wastes and many dissolved organic compounds like - carbohydrates.

Protein, fats, urea etc.
inorganic salts as nitrates,
phosphates of detergents etc.



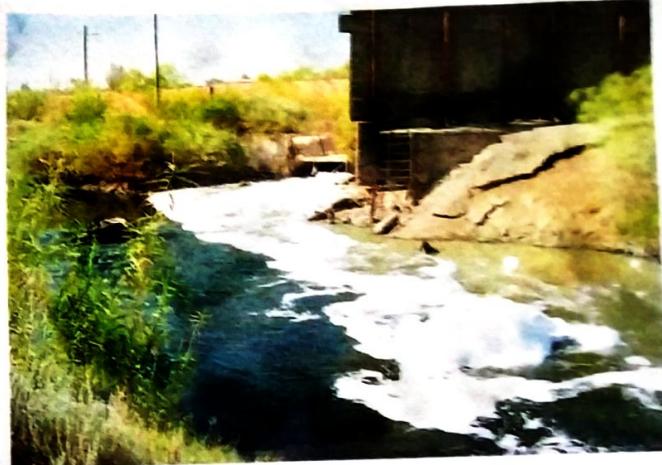
Effect :- In water, organic wastes provide nutrition for many decomposers like bacteria. These break the organic part by using bulk of oxygen and cause deficiency of oxygen in water that kills the fishes and other animals. organic Sulphide and methane also produced by those bacteria that makes the water brownish and turbid.

② Industrial wastes and effluents:

The industrial wastes and their effluents include poisonous materials like acids, alkalies, chromium salts, phenols, cyanides, insecticides, agricultural chemicals, chlorine, and salts of heavy metals such as Cu, Pb, Zn etc.

Effects :-

- ① The water becomes toxic and deoxygenated, so this cannot support aquatic life.
- ② Mercury (Hg) enters the food chain, kills fish and poisons the remaining fauna.
- Mercury causes Minamata disease.
- Black foot disease^{is caused} by chronic exposure to Arsenic also, exposure of as may cause skin cancer etc. chronic disease. Cancers, skin cancer, lungs



③ Dumping's

Dumping of solid wastes and litters in Water bodies cause huge problems. Litters include glass, plastic aluminium, styrofoam etc. Different things take different time to degrade in water.



Effects: They effect the aquatic plants and animals.

④ Mining activities →

Mining is the process of crushing the rock and extracting coal and other minerals from the underground. These elements, when extracted in the raw form, contain harmful chemicals and can increase the no. of toxic elements when mixing up with water.

Effects → Release of toxic chemicals in water may cause health problems of aquatic animals as well as of human.

⑤ Accidental oil leakage →

A ship carrying a large quantity of oil may spill oil in sea if met an accident.

→ In 1967 large oil tanker Torrey canyon met an accident and release 10000 ton crude oil in sea of southern England.

Effects:-

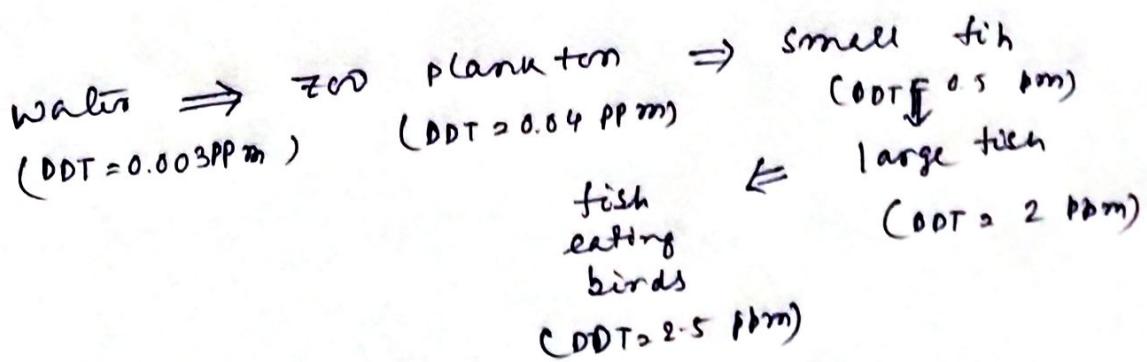
Such an oil spill can cause various damages to the species in the ocean, depending on the amount of spill, the toxicity of the pollutants and the size of ocean. It causes problems for local marine wildlife including fish, birds and sea otters.

⑥ Insecticides and pesticides:-

Insecticides are biologically active chemicals that are used for pest control. These includes D.D.T, B.H.C and aldrin etc. Fish feeding on these zooplanktons and phytoplanktons rapidly spread it through other trophic levels.

Effects:-

■ Biomagnification:-
 Aquatic microorganisms absorb the insecticides in the fats and oils. Fish feeding on these zooplanktons and phytoplanktons further concentrate these pesticides still more. The increased accumulation of these toxic substances in the food chain at higher trophic level is called biological magnification.



(7) Erosion :-

Excessive agricultural and forestry practices cause soil erosion (removal of top fertile soil) during heavy rain and through rain water. Soil particles mixed with rivers or any other water bodies.

Effects :- The water becomes muddy which fails to support much plant growth due to poor light.

(8) Detergents and Fertilizers :-

Detergents are washing materials in waters which cause soapiness. These form a film around organic waste.

Some of the fertilizers such as nitrates and phosphates are used in agriculture to increase the crops yield, reach into rivers and ponds through irrigation, rainfall and drainage, where they seriously disturb the aquatic ecosystem.

Effects

- ◻ When such waters are used by animals, the nitrates of polluted water become reduced to toxic nitrites in the body combine with hemoglobin to cause a serious disease called methaemoglobinemia or Blue baby syndrome. It is very dangerous.

■ Eutrophication :

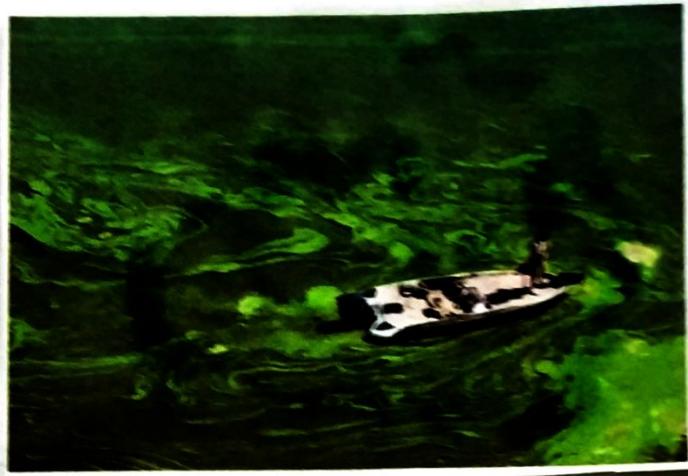
The natural aging of a lake by biological environment of its

water is known as eutrophication. In a

young lake, the water remains cold and clear supporting little life. With time streams draining into the lake introduce nutrients

such as nitrogen and phosphorus, which encourages the growth of aquatic organisms. Now, in

this situation growth of phytoplankton rapidly increases that covers the surface of water, which is called algal bloom. Now, as the lake's fertility increases, plant and animal life becomes and organic remains begin to be deposited on the lake bottom eventually the lake grows older and gives large masses of floating plants, finally converted into land.

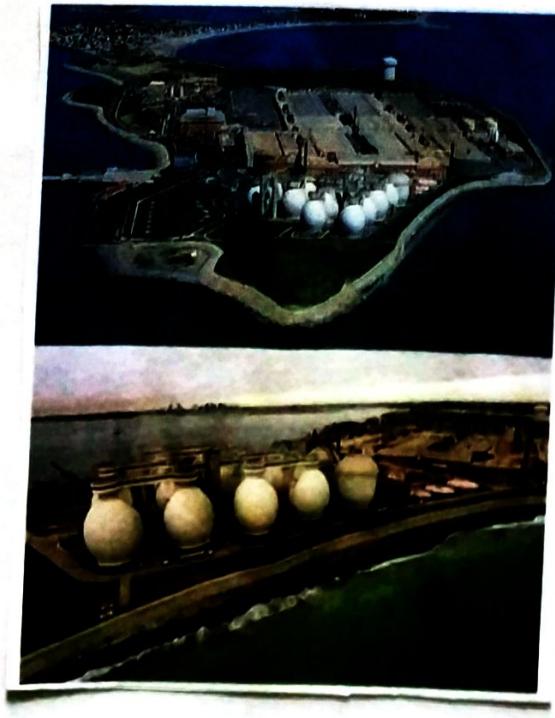


① Prevention measures of water pollution:

It is very important to prevent the polluting of water bodies and remove existing contaminants or reducing the concentration of these contaminants so as to make it fit for desired use. So, now we will follow some of the ways of treating polluted water.

① Industrial waste water treatment: The raw sewage is needed to be treated correctly in a water treatment plant before it can be safely released into the environment. To reduce the toxicity of waste, it is passed through a number of chambers and chemical processes in water treatment plant.

Industries that generate wastewater with high concentrations of organic matter (e.g. oil and grease), toxic pollutants (e.g. heavy metals), need specialized treatment systems.



② Erosion and Sediment:

Firstly to stop erosion and sedimentation of loose soil particles we have to plant more trees specially aside water bodies that can prevent erosion of soil very much.

Also to stop sedimentation of various hard particles in water bodies from construction site, we may apply slit fence.



③ Retention basin for controlling urban runoff:

Effective control of urban runoff involves reducing the velocity and flow of storm water, as well as reducing the velocity and flow of storm water, as well as reducing pollutant discharge.



④ Denitrification:

When nitrates present in water get converted into gas. It is known as denitrification. It is an ecological approach that prevents leaching of nitrates in the soil. It stops ground water from getting contaminated.

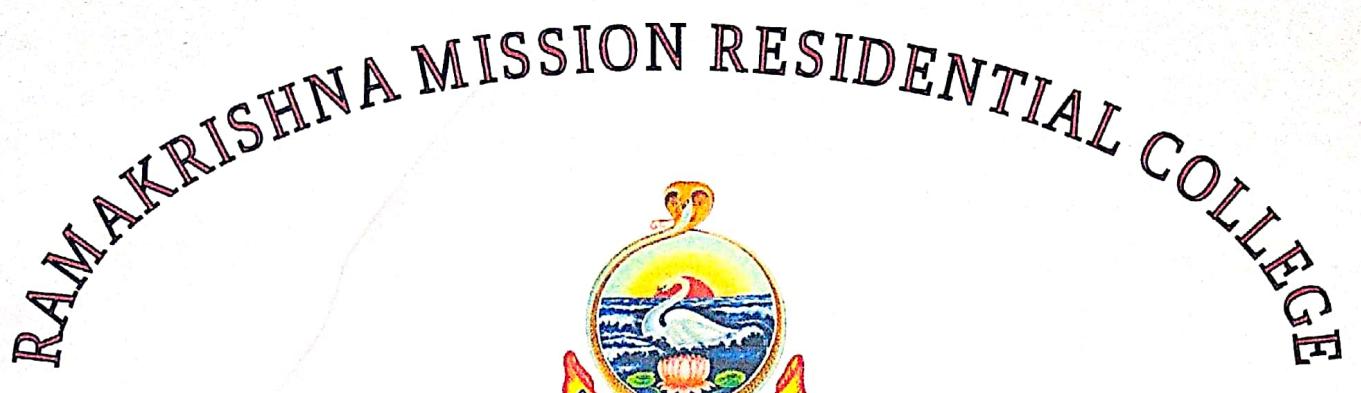
⑤ Ozone waste water treatment:

The ozone waste water treatment method has become very popular. In this method, an ozone generator breaks down the pollutants in water. Ozone oxidises bacteria, organic materials, molds etc.

⑥ Septic tanks: Septic tanks treat sewage right at the place of the location where it originates instead of treating it in any far-away plant or sewage system. This system is usually put to use at the individual building level. The sewage gets separated into solid and liquid components and treated separately.

⑦ Removing heat from wastewater:
To remove heat from wastewater generated by power plants or manufacturing plants like following technologies are used: cooling ponds, man-made bodies of water designed for cooling by evaporation, convection and radiation.

■ Conclusion : Water pollution is mainly cause of our undisciplined actions and irresponsibility. Mainly, we, humans are creating problems that consequently we will also carry the burden of these problems. So, let's just realize how important our mother nature is. It is our only source of living. Let's not destroy it nor pollute it. Let us act for a change. We need and we should help, save and conserve our mother nature, especially the diff. bodies water, which are very crucial to maintain the balance of nature.



NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE:

Water Pollution and Measures fo
Control it.

NAME : Suraj Oraon
COLLEGE ROLL NO : ENUG/026/19
DEPARTMENT : English
YEAR : 2020
SIGNATURE : Suraj Oraon.

Contents

Page No.

• Acknowledgement	1.
• Introduction	2.
• What is Water Pollution ?	3
• Point and non-Point Sources of pollution.	3
• Effects of Water Pollution	4 - 6
• Basic Parameters for calculating water pollution	6 - 7
• Water Pollution Control Measures	7 - 10
• Conclusion	10 .
• Bibliography	11

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Secondly, I would also like to thank my parents and friends who helped me a lot in finishing this project within this limited time.

I am making this project not only for marks but also to increase my knowledge.

Introduction:

"Our liquid planet glows like a soft blue sapphire in the hard-edged darkness of space. There is nothing else like it in the solar system. It is because of water"

— John Todd.

Water is one of the most vital natural resources on earth and has been around for a long time. In fact, the same water which we drink has been around in one form or the other since the time of the dinosaurs.

The earth has more than two-thirds of its surface covered with water. This translates to just over 1 octillion litres (1,260,000,000,000,000,000,000 litres) of water distributed in the ocean, rivers, lakes and streams.

That is a lot of water however, less than 0.3% is accessible for human consumption. As commercialization & industrialization have progressed, that number continues to dwindle down. Furthermore, inefficient and outdated practices, lack of awareness and a plethora of other circumstances have led to water pollution.



Date :

Teacher's Signature :

What is Water Pollution?

Water pollution is the addition/presence of undesirable substances to/in water such as organic, inorganic, biological, radiological, heat, which degrades the quality of water so that it becomes unfit for use.

Natural Sources of pollution of water are soil erosion, leaching of minerals from rocks (due to natural solubility or solubility triggered by acid rain) and decay of decaying organic matter.

Point and non-point sources of pollution

When pollutants are discharged from a specific location such as a drain pipe carrying industrial effluents discharged directly into a water body it represents point source pollution.

In contrast, non-point sources include discharge of pollutants from diffused sources or from a larger area such as runoff from agricultural fields, grazing lands, construction sites, abandoned mines and pits etc.,



Effects of Water Pollution.

The effect of water pollution depends upon the type of pollutants and its concentration. Also, the location of water bodies ~~as~~ is an important factor to determine the levels of pollution.

Water Bodies in the vicinity of urban areas are extremely polluted. This is the result of dumping garbage and toxic chemicals by industries and commercial establishments.



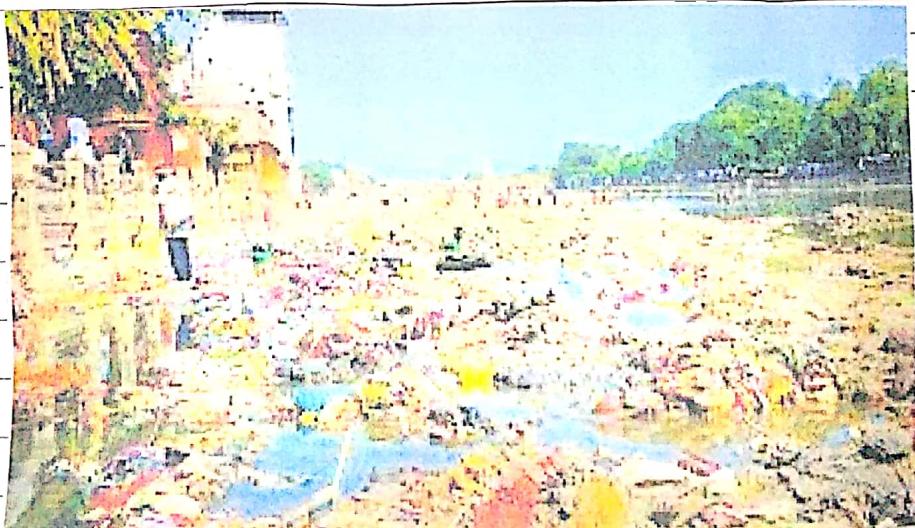
Water pollution drastically affects aquatic life. It affects their metabolism, behaviour, causes illness and eventual death. Dioxin is a chemical that causes a lot of problems from reproduction to uncontrolled cell growth or cancer. This chemical is bioaccumulated in fish, chicken and meat. Chemicals such as this travel up the food chain before entering the human body.

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The effect of water pollution can have a huge impact on the food chain. It disrupts the food-chain. It disrupts the Cadmium and leads are some toxic substances, these pollutants upon entering the food chain through animals (fish when consumed by animals, humans) can continue to disrupt at higher levels.

Human are affected by pollution and can contract diseases such as hepatitis through faecal matter in water sources. Poor drinking water treatment & unfit water can always cause an outbreak of infectious diseases such as cholera etc.,



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The ecosystem can be critically affected, modified and destructured because of water pollution.

Basic parameters for calculating water pollution:-

- **Dissolved Oxygen (DO):** It is the amount of oxygen dissolved in water and is usually measured by Oxygen probe (DO electrode) or Winkler Dissolved Oxygen test. DO below 8 ppm indicates pollution, and below 4 ppm indicates heavy pollution. In unpolluted water, DO should be about 14 ppm.
- **Biological Oxygen Demand (BOD):** The amount of oxygen (in mg) required by microorganisms to stabilize decomposable organic matter in one litre of polluted water for 5 days at 20°C.

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• **Chemical Oxygen Demand (COD):** The amount of oxygen of polluted water is measured by chemical method using potassium dichromate as the oxidizing agent.

Water Pollution Control Measures.

Realising the importance of maintaining the cleanliness of the water bodies, the Government of India has passed the Water (Prevention and Control of Pollution) Act, 1974 to safeguard our water resources and ~~then~~ an ambitious plan to save the river called the Ganga Action Plan was ~~launched~~ launched in 1985.

In India, the Central Pollution Control Board (CPCB), an apex body in the field of water quality management has developed a concept of "designated best use".

Accordingly, the water body is designated as A, B, C, D, E on the basis of pH, dissolved oxygen, mg/l, BOD, (200C)mg/l, total coliform (MPN/100 ml), free ammonia mg/l, electrical conductivity etc., The CPCB in collaboration with the concerned State Pollution Control Boards, has classified all the water bodies including coastal waters in the country according to their "designated best uses".

This classification helps the water quality managers and planners to set water quality targets and identify needs

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and priority for water quality managers and planners and restoration programmes for various water bodies in the country.



- ④ Treatment of sewage water and the industrial effluents before releasing it into water bodies. Hot waters should be cooled before release from the power plants.
- ⑤ Excessive use of fertilizers and pesticides should be avoided. Organic farming and efficient use of animal residues as fertilizers can replace chemical fertilizers.
- ⑥ Water hyacinth (an aquatic weed, invasive species) can purify water by taking some toxic materials and a number of heavy metals from water.
- ⑦ Oil spills in water can be cleaned with the help of Gregoli.

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- ① It has been suggested that we should plant eucalyptus trees all along sewage ponds. These trees absorb all surplus water rapidly and release pure water vapour into the atmosphere.
- ② Bio remediation is the use of microorganisms to degrade the environmental contaminants into less toxic forms. But, it often takes a longer time than other treatment processes.
- ③ Disinfection :- Water is disinfected before it enters the distribution system to ensure that any disease causing bacteria, viruses and parasites are destroyed.
- ④ Chlorine is used because it is very effective disinfectant, and residual concentrations can be maintained to guard against possible biological contamination in the water distribution system. This addition of chlorine or chlorine compounds to drinking water is called chlorination.
- ⑤ Filtration :- Water flows through a filter designed to remove particles in water. The filters are made of layers of sand and gravel and in some cases, crushed anthracite. Filtration collects the suspended impurities in water & enhances the effectiveness of disinfection. The filters are routinely cleaned by backwashing.



⑩ **Sedimentation** :- As the water and the floc particles progress through the treatment process, they move into sedimentation basins where the water moves slowly, causing the heavy floc particles to settle to the bottom. Floc which collects on the bottom of the basin is called sludge and is piped to drying lagoons. In Direct filtration, the sedimentation step is not included and the floc is removed by filtration only.

Conclusion :-

Hence, Preventing water pollution and conserving water are important to assure a continuing abundance of water that is safe to use for ourselves and future generations. Water pollution is any human-caused contamination of water that reduces its usefulness to humans and other organisms in nature.

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BIBLIOGRAPHY

I have taken references and points from the following sources for my knowledge about water pollution and measures to control it and associated some pictures from those sources:-

- (i) Google
- (ii) Wikipedia.
- (iii) BYJU's website .
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- (v) Environmental science textbook provided by UGC .
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