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Batch : 63

Subject : Environmental Science.

→ Q.No. 2. Eutrophication is a phenomena caused by the abnormal growth of algae in a water body? What are the reasons of algal bloom and how can this phenomenon be controlled?

1 Introduction :-

The term "eutrophic" means well-nourished; thus, "eutrophication" refers to natural or artificial addition of nutrients to bodies of water and to the effects of the added nutrients. When the effects are undesirable, eutrophication may be considered a form of pollution. Nixon (1975) defined it as an increase in the rate of supply of organic matter in an ecosystem. It is the process by which a body of water acquires a high concentration of nutrients, especially phosphates and nitrates. These typically promote excessive growth of algae. As the algae die and decompose, high levels of organic matter

and the decomposing organisms deplete the water of available oxygen, causing the death of other organisms, such as fish. Similarities, including subsequent negative environmental effects such as anoxia, and severe reduction in water quality, and other animal populations may occur.

2.2 → Eutrophication is a phenomena caused by the abnormal growth of algae in a water body:-

2.1 → What is Eutrophication:-

Eutrophication is a complex environmental phenomenon characterized by the abnormal growth of algae in a water body, leading to ~~detrimental~~ detrimental effects on aquatic ecosystems. This process occurs when excess nutrients, primarily nitrogen and phosphorus, accumulate in water bodies.

2.2 → Causes of abnormal Algae Growth:-

The abnormal growth of algae is triggered by human activities that release excessive nutrients into water bodies. Other species may

experience an increase in population that negatively affects other species in the direct ecosystem. In simpler terms it is the bloom of phytoplankton in a water body. It is often the result of anthropogenic pollution with nutrients, particularly the release of sewage effluent and agricultural run-off carrying fertilizers into natural waters.

It also occurs naturally in situations where nutrients accumulate, or where they flow into systems on an ephemeral basis.

Eutrophication generally promotes excessive plant growth and decay, favours simple algae and plankton over other more complicated plants, and cause a severe reduction in water quality.

Agricultural runoff, sewage and wastewater discharge, industrial effluents, and atmosphere deposition. These nutrients fuel the growth of algae, disrupting the natural balance of aquatic ecosystems.

2.3 → Role of Nutrients in Algae Growth:-

Nutrients such as nitrogen and phosphorus are essential for algae growth. However, in excess, they stimulate rapid growth,

- (i) Increased Phytoplankton biomass.
- (ii) Enhanced Photosynthesis.
- (iii) Rapid cell division.

2.3 → Effects of Abnormal Algae Growth:

3.1 Consequences of Algal Blooms:-

The abnormal growth of algae has far-reaching consequences.

(i) Depletion of Dissolved Oxygen:-

Algae consumption of oxygen leads to hypoxia.

(ii) Reduced Water Transparency.

Algal blooms decrease water clarity.

(iii) Alteration of Aquatic Food Chains:-

Changes in algae populations impact aquatic species.

(iv) Production of Toxins:- Certain algae

produce toxins harmful to humans and wildlife.

3.2 → Impact on Aquatic Life:-

Abnormal algae growth harms aquatic life in various ways:

(i) Fish Kills:- Reduced oxygen levels

lead to fish mortality.

iii Changes in Species Composition:-

Altered food chains impact sensitive species.

iii Loss of Biodiversity:-

Eutrophication contributes to ecosystem degradation.

3.3 Human Health Risks:-

Exposure to toxic algae blooms poses health risks to humans, including:

vi Respiratory Issues:-

Inhaling toxins from algae blooms.

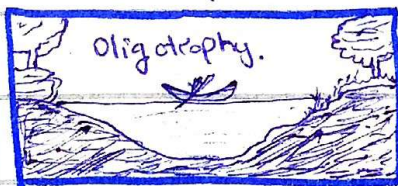
vii Skin Irritation:-

Contact with toxic algae.

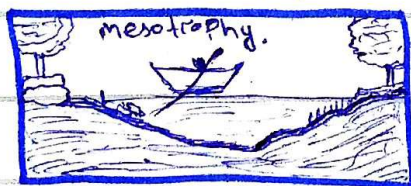
viii Gastrointestinal Problems:-

Ingesting contaminated water or seafood.

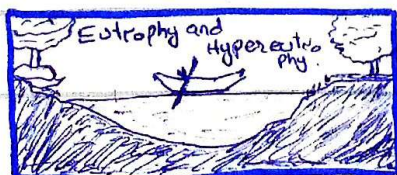
Natural Eutrophication.



Thousands of years.



Hundreds and



Anthropogenic or "man-made" eutrophication.



Decades.
Urban Runoff
Industrial Discharge
Fertilizers and
Pesticides,
Erosion and
Sedimentation.
Nonpoint source.



(Process of Eutrophication)

4. Classification of Aquatic System:-

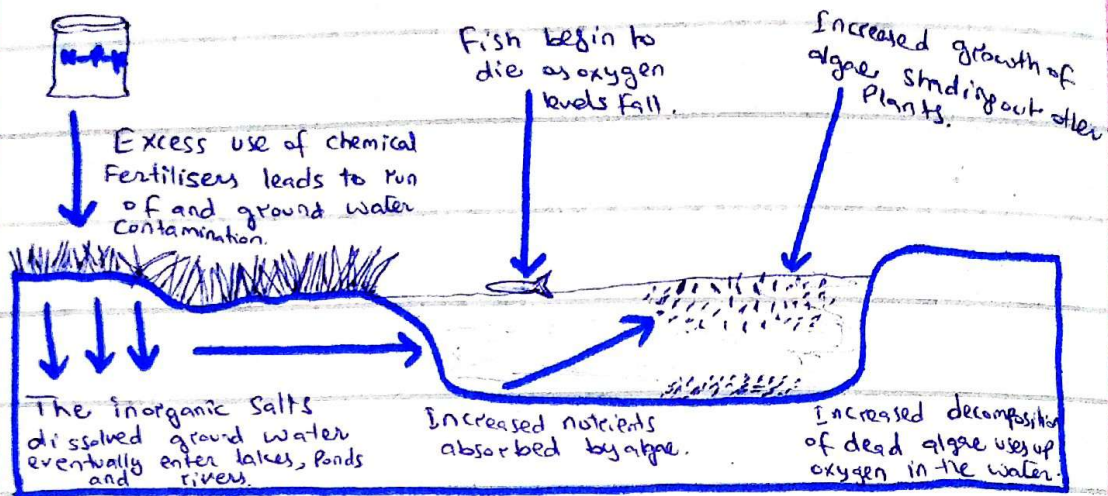
- (1) Oligotrophic:- Poor nutrient status and Poor Productivity.
- (2) Mesotrophic:- Moderate nutrient status and moderate Productivity.
- (3) Eutrophic:- Rich nutrient status and rich Productivity.

4.1 → Process:- Due to addition of nutrients, oligotrophic Aquatic system converts into mesotrophic Aquatic system and mesotrophic Aquatic system converts into Eutrophic Aquatic system. Water loses its aesthetic and economic value. Organic debris and silt settles at the bottom. Margins of aquatic body turn into a marsh with a small shallow pond at the centre.

5 → Liebig's Law of Minimum:-

Growth of plant primarily depends upon availability of controlling nutrients. According to Liebig, continuation of growth depends upon availability of minimum quantity of anyone of the controlling nutrients and the corresponding nutrients are called limiting nutrients. Eutrophication can be controlled by controlling the concentration

of limiting nutrients.



(Role of Fertilizers in Eutrophication)