

Q#01:-

(1)

Ans:- Waste Water Treatment:- Wastewater

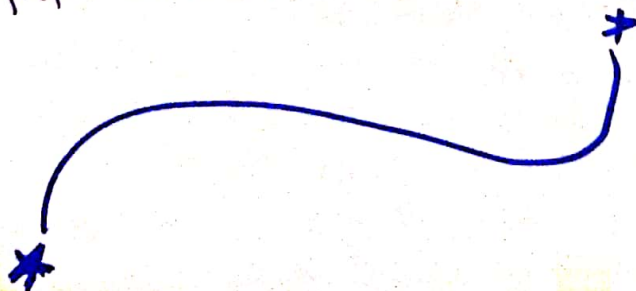
treatment is a process used to remove contaminants from wastewater or sewage and convert it into an effluent that can be returned to water cycle with minimum impact on the environment or directly reused. The treatment process takes place in wastewater treatment plant (WWTP).

Importance of waste water Treatment:-

- 1) It is important to produce an environmentally safe fluid waste stream and a solid waste suitable for disposal or reuse.
- 2) It is very important to provide some degree of treatment to waste water before it can be for agricultural or for irrigation.
- 3) It is important to produce an environmentally safe fluid waste stream and a solid waste suitable for disposal or reuse.
- 4) The major aim of wastewater treatment is to remove the suspended solids as possible before the remaining water called effluent is discharge back to the environment.

- 5) Waste water treatment is fundamental to protect the health of many different ecosystems.
- 6) Good wastewater treatment allows the maximum amount of water to be reused instead going to waste.
- c) Why rectangular tanks are preferred over circular tanks for removal of settleable solids:-
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- 1) Rectangular tanks require less land than circular tanks.
- 2) Require less head loss for rectangular tanks.
- 3) The shape of the rectangular clarifiers provides a less longer path for wastewater flow and the suspended solids to travel and subsequently longer detention time which warrants less short-circuiting and more sludge settling compared to the centre-feed/peripheral overflow circular clarifiers/tanks.
- 4) Flow distribution configuration for rectangular tanks require simpler and less expensive pipework layout while circular require complicated and expensive pipe work.



Q#02:-

(3)

Ans:- Aerobic Wastewater Treatment:-

- 1) Process for treating sewage or industrial wastewater using aeration and a biological floc composed of bacteria and protozoa.
- 2) It is a biological process that can be used for oxidizing carbonaceous biological matter, oxidizing nitrogenous matter ( $\text{NH}_3$  &  $\text{N}_2$ ), removing nutrients (N & P).
- 3) Aeration methods - diffused aeration, surface aeration (cones) and pure oxygen aeration.

AN-Aerobic Wastewater Treatment:-

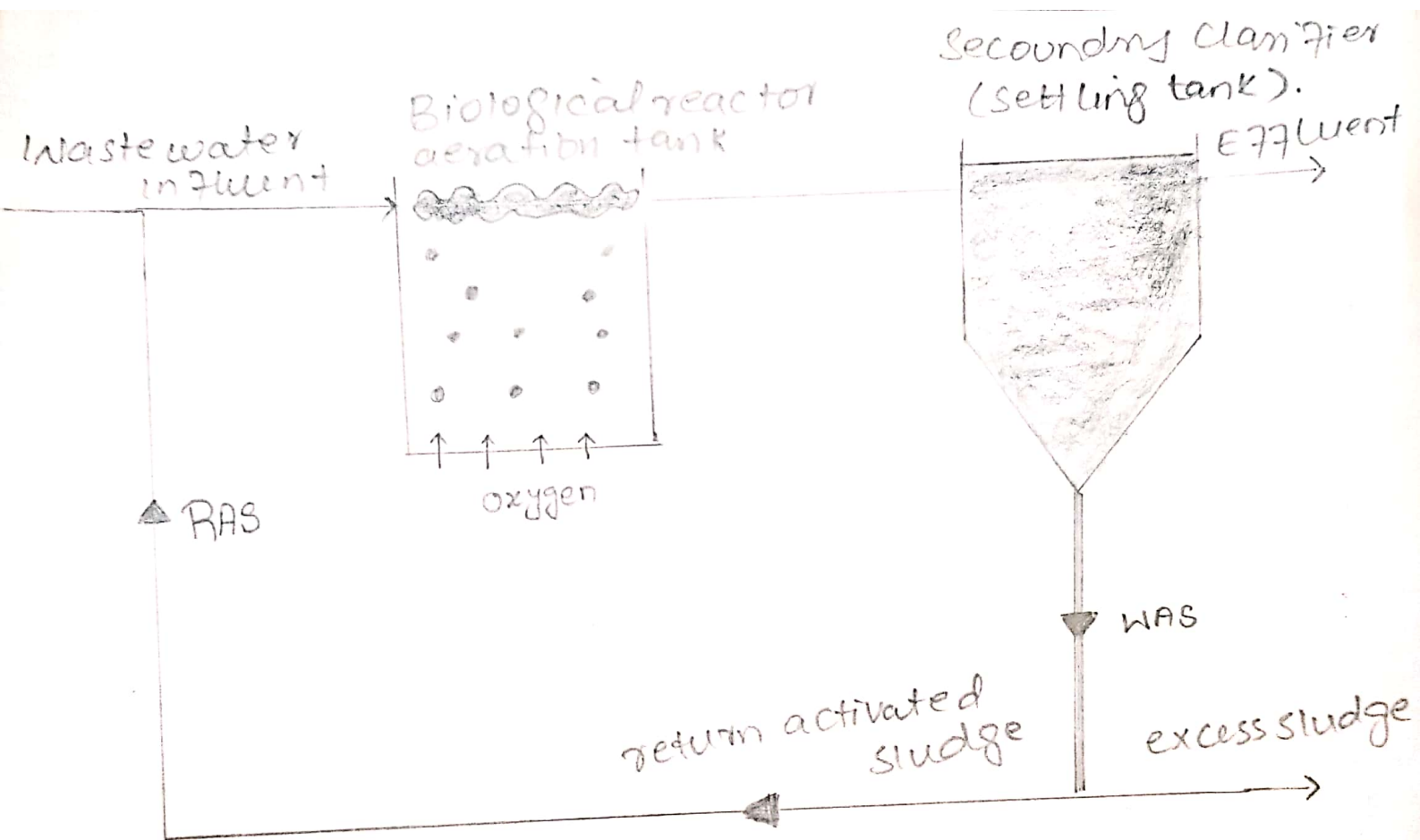
- 1) Anaerobic bacteria transform organic matter in the wastewater into biogas that contains large amount of methane gas and carbon dioxide.
- 2) It is energy-efficient process.
- 3) It is often used to treat industrial wastewater that contains high level of organic matter in warm temperatures.
- 4) It can be used as a pretreatment prior to aerobic municipal waste water treatment.

Q#2:- (b)

(4)

Ans:- Activated Sludge Process:-

- 1) Main constituents of ASP are aeration tank in which oxygen is provided for the micro-organisms to grow. This aeration also helps to keep micro-organisms in suspension.
- 2) Aeration tank is followed by clarifiers/settler in which the micro-organisms form flocs & settle down at the bottom.
- 3) Micro-organisms responsible for treatment are maintained in liquid suspension by appropriate mixing methods.
- 4) A part of settled bio flocs are recycled back to the aeration tank to maintain a certain amount of micro-organisms in the system for efficient operation of the system. This is known as recycled Activated Sludge (RAS).
- 5) Formation of floc particles, ranging in size from 50 to 200  $\mu\text{m}$  removed by gravity settling leaving relatively clear liquid as treated effluent.
- 6) Removing settled bio flocs from the system and is termed as "wasted Activated Sludge" (WAS).



(5)

Q#03:-

Ans:- Assimilative Capacity of receiving water bodies:-

The ability of a body of water to clean itself; its capacity to receive wastewater without deleterious effects and without causing damage to aquatic life or humans who consume the water. It is level to which water body or nature control the toxicity without affecting the aquatic life.

Although wastewater is properly treated before it is disposed of to the natural water streams still it has impurities/pollutants that need to be removed or make them less effective so that the receiving water bodies may not become unsuitable for use or cause damage to the aquatic life.

How does it help in wastewater treatment:-

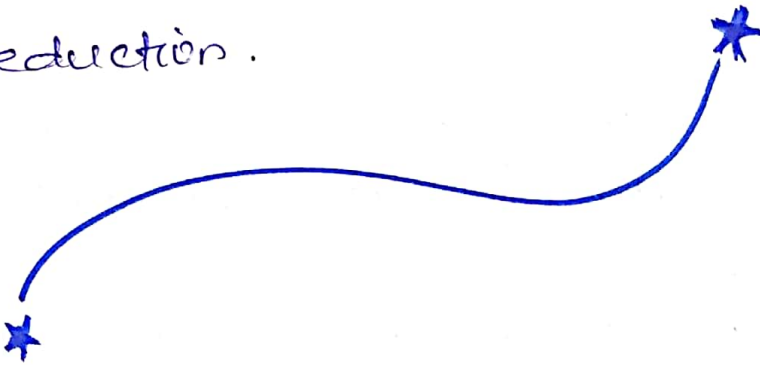
- 1) Dilution:- Dilution is the process of reducing the concentration of pollutants in receiving water, usually simply by mixing with more quantity of water.
  - 2) Dispersion:- Dispersion is the distribution of pollutants in relatively large area of water.
- ~~Dilution~~ Dilution and dispersion are interrelated.

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3) Sunlight: Sunlight facilitates biological decomposition of pollutants & kills pathogens by ultraviolet radiation (UV).

Chemical forces which Includes

- (1) Oxidation
- (2) Reduction.



Q#04:-

Ans:- Sludge management:-

Sludge treatment is the process used to manage and dispose of sewage sludge produced during waste water and drinking water treatment.

Sludge is mostly water with lesser amount of solids materials removed from liquid sewage.

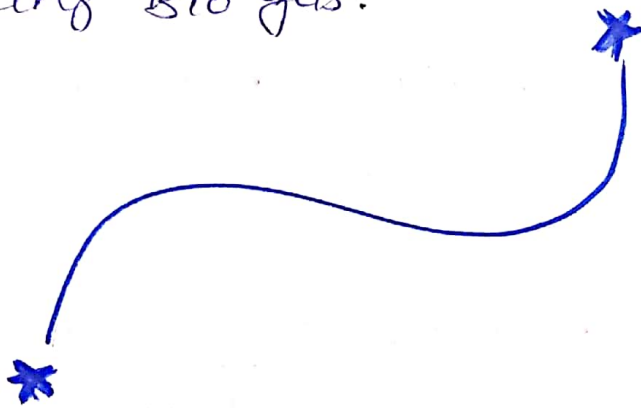
Treatment Processes:-

- 1) Thickening:- Gravity & Flootation
- 2) Digestion:- Aerobic, Anaerobic
- 3) Mechanical Dewatering:- Vacuum filtration, centrifugation
- 4) Disposal:- Land application, Burial.

(7)

## Advantages of Sludge treatment:-

- 1- It reduces Pathogens and volume to be disposed
- 2- Protects wild life, aquatic life and also prevents diseases.
- 3- Sustainable management of organic waste
- 4- Reduction of odors and disease causing agents
- 5- Producing Bio gas.



Q#05:-

Ans:- Environmental Impact Assessment:-

An environmental study comprising collection of data, prediction of qualitative and quantitative impacts, comparison of alternatives evaluation of preventive, mitigatory and compensatory measure, formation of environmental management and training plans and monitoring arrangements, and framing of recommendation and such other components as may be prescribed.



## Parameters of importance:-

Waste water contains a large number of contaminants and they are categorised as physical, chemical and biological contaminants. Different parameters have been established from experience and theory to define such characteristics. The most important parameters to be considered for local wastewater treatment plant are;

### 1- Bio-chemical Oxygen Demand (BOD):-

The BOD is the amount of oxygen consumed by aerobic microorganism to break down the organic matter present in the wastewater. It is the BOD<sub>t</sub> which is the actual measured parameters and is ~~the actual~~ an indication of the amount of organic matter consumed within 5 days as from testing this value is used to measure the efficiency of a treatment plant in terms of organic matter removal. High BOD value undesirable and would affect ecological cycle by reducing the normal dissolved oxygen to critical levels for sustaining aquatic life.

## 2) Chemical Oxygen Demand (COD):-

The COD is an alternate measure of the amount of ~~oxygen~~ organic matter. The amount of oxygen used up by a strong oxidizing Agent is measure this value is of greater importance when evaluating wastewater from industries since these effluents tend to be toxic to microorganisms thereby affecting the validity of BOD results

## 3) Total Suspended Solids (TSS):-

The TSS is measured to indicate the amount by mass of fine suspended particles effluent discharge in the water course must contain low levels of TSS since TSS cause turbidity affecting the amount of light to aquatic plants and also causes visual pollution

## 4) Total Kjeldahl Nitrogen (TKN):-

waste water usually contains high level of Nitrogen containing compounds. The nitrogen exists mostly in free forms; organic nitrogen ammonia and reduced nitrogen the TKN value hence indicates the amount of nitrogen of all these 3 forms.