

## **7th Standard- Science**

### **Waste Water Story**

Water is an elixir of life. We all use water and in that process of using, we make it dirty. The water rich in a lather, mixed with oil and other pollutants that go down the drains from sinks, showers, toilets, laundries is dirty. It is called wastewater.

We use water every day for drinking, bathing, washing clothes, cooking food, washing utensils, flushing toilets, mopping the floors, etc. We cannot think of our life without water. We use lots of water daily which is passed on to the drainage system every day.

#### **Water, Our Lifeline**

Water is needed by all forms of life. Clean water is a basic need of human beings. Unfortunately, clean water is not available to a large segment of human populations.

The water which is unfit for human consumption becomes the source of many water-borne diseases which ultimately lead to loss ( of human life. It is estimated that one billion human beings do not get safe drinking water. So, realising the urgency we celebrate 22nd March as World Water Day to bring awareness amongst people for safe water, fit for human consumption. Thus, the water is cleaned by removing pollutants before it enters a waterbody or is reused.

This process of wastewater treatment is commonly known as sewage treatment which takes place in several steps as discussed later.

On the World Water Day, i.e. 22 March 2005, the General Assembly of the United Nations proclaimed the period 2005-2015 as the International Decade for action on Water for Life. All efforts made during this decade aim to reduce by half the number of people who do not have access to safe drinking water.

### **Sewage**

It is wastewater released by homes, industries agricultural fields and other human activities. It also includes rainwater that has run down the street during a storm or heavy rain and it is liquid waste. Most of its water has dissolved and suspended impurities called contaminants.

### **Composition of Sewage**

The following components make the sewage:

- The organic impurities present in sewage are human faeces, animal wastes (like animal dung), urea (as urine), oil, fruits and vegetable wastes, pesticides, herbicides, etc.
- The inorganic impurities present in sewage are nitrates, phosphates and metals.
- The nutrients present in sewage are nitrogen and phosphorus.
- The bacteria present in sewage include those bacteria which cause water-borne diseases such as cholera and typhoid.
- The other microbes present in sewage are Protozoa which cause a water-borne disease called dysentery.

## **Water Freshens Up: An Eventful Journey**

In a house (a public building) generally, there are two sets of pipes, i.e. one set of pipes brings clean drinking water into the house and the other set of pipes takes away wastewater (sewage) from houses. For proper sanitation, a well-maintained sewage system is required.

## **Sewerage System**

The pipes which carry away wastewater or sewage from houses and other buildings are buried under the ground. An underground pipe which carries away dirty drainage water and waste matter is called sewer. The provision of drainage at a place by laying sewers under the ground is called sewerage. Actually, sewerage is an underground network of interconnected pipes called sewers that carries the sewage from the place where it is produced to the sewage treatment plants, where it is processed.

## **Manholes**

A manhole is a covered vertical hole in the ground, pavement or road, above the underground sewer pipeline through which a worker can go down up to the sewer pipes for inspection, cleaning, etc. Manholes are provided at every 50-60 m distance in the main sewer pipeline. Manholes are also provided at the junction of two or more sewers and at points where there is a change in the direction of the sewer line.

## **Treatment of Polluted Water**

Perform the following activity. It will help you to understand the processes that take place at the wastewater treatment plant.

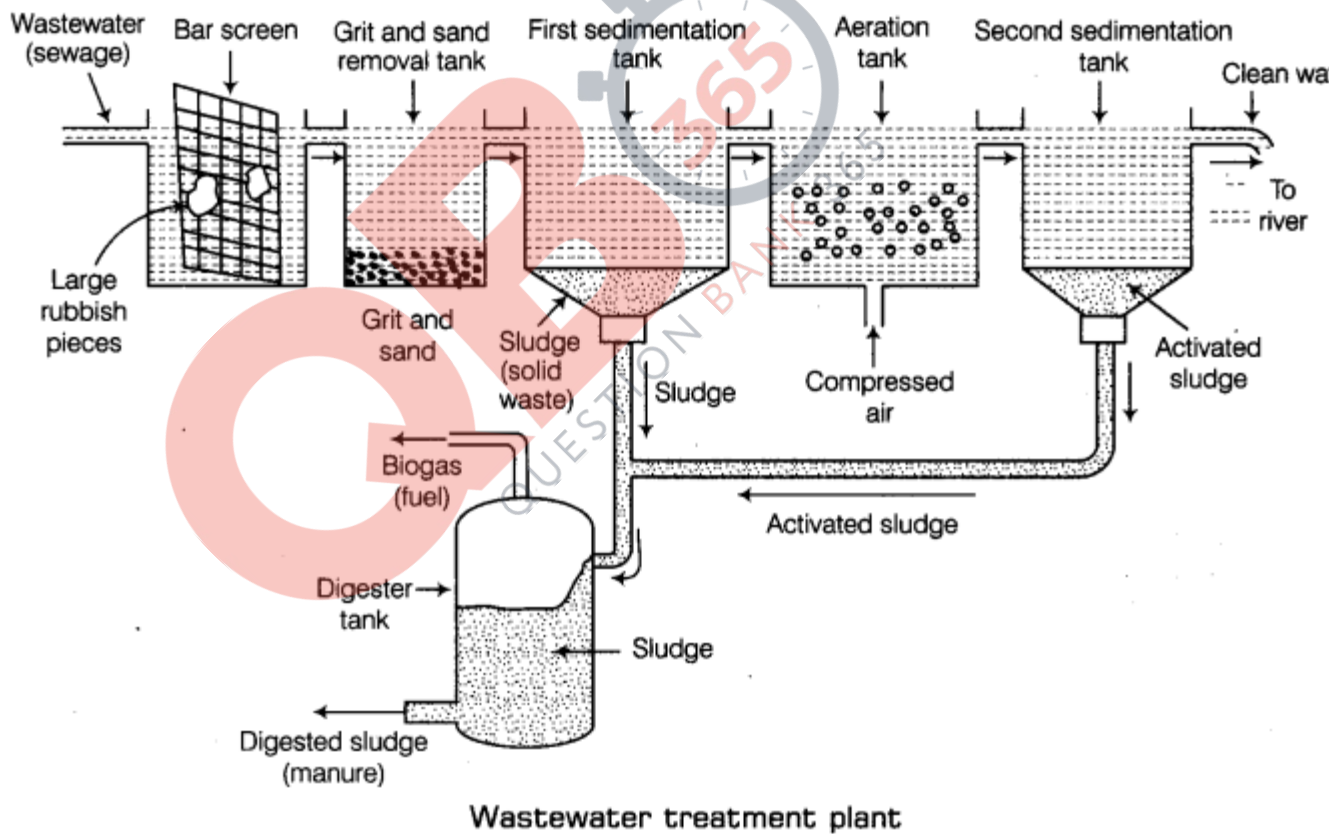
## Wastewater Treatment Plant (WWTP)

A place where wastewater or sewage from houses and other buildings is brought for processing is called wastewater treatment plant.

Treatment of wastewater involves physical, biological and chemical processes depending on the nature of contaminants.

### 1. Physical Process (Screening)

The bar screens first remove the large rubbish objects like rags, sticks, cans, polybags, napkins, sanitary towels, etc., from the wastewater.



After passing through the bar screen, wastewater is taken to a tank called grit and sand removal tanks.

2. In this, sand and grit settle down slowly at the bottom of the tank as water passes slowly through this tank. The settled sand and impurities are removed from the tanks from time to time.

## **2. Biological Process**

The first sedimentation tank is sloped towards the centre. Solid like faeces settle at the bottom and is called sludge which is removed by a scraper. Oils and grease float at the surface of the water are removed by a skimmer. The biogas produced (by anaerobic bacteria) in the process can be used as fuel or can be used to produce electricity. Here, water gets cleared of rubbish, oil, grease, etc and we get clarified water which is sent to aeration tank now. In the aeration tank, the watery waste already contains bacteria (aerobic) in it. The compressed air bubbles are passed through this waste to provide  $O_2$  to the bacteria to increase bacterial activity which ultimately digests human waste, food waste, soaps and other unwanted and harmful matter still remaining in the wastewater leaving behind fairly pure water.

## **3. Chemical Process**

The water after aeration tank is allowed to stand in a second sedimentation tank. Here, the microbes present get settled at the bottom at the tank in the form of activated sludge which is about 97% water. At this stage, water has very low level of organic matter suspended matter and does not contain many harmful things. It is safe for human consumption but is disinfected by chlorine or ozone before distributing it.

### **Become an Active Citizen**

Waste generation is a natural part of human activity but we can limit the type of waste and quantity of waste produced. Often we have been repelled by an offensive smell. The sight of open drains is disgusting. The situation worsens in the rainy season when the drains start overflowing. We have to wade through the mud pools on the roads. Most unhygienic and unsanitary conditions prevail. Flies, mosquitoes and other insects breed in it.

We should be an enlightened citizen and approach the municipality or the gram panchayat. We should also insist that open drains should be covered. If the sewage of any particular house makes the neighbourhood dirty. We should request them to be more considerate about other's health.

**Note:** We should plant Eucalyptus trees all along sewage ponds. These trees absorb all surplus wastewater rapidly and release pure water vapour into the atmosphere.

### **Better House Keeping Practices**

We must minimise and manage waste at our houses before its disposal in the following manner:

- Cooking oil and fats should not be thrown down the drain. They can harden and block the pipes. In an open drain, the fats clog the soil pores reducing its effectiveness in filtering water. Throw oil and fats in the dustbin.

- Used tea leaves, solid food remains, soft toys, cotton, sanitary towels, etc., should also be thrown in the dustbin.
- These wastes choke the drains. They do not allow the free flow of oxygen. This hampers the degradation process.
- The chemicals like paints, solvents, insecticides, medicines and motor oils should not be thrown in drains as they kill helpful microbes which digest the organic waste.

### **Sanitation and Disease**

Contaminated water and poor sanitation practices are the major causes of the number of infectious diseases in our country. Safe sewage disposal facilities are still not available at many cities and villages in India. So, people go to open places and defecate. This causes the increase in insect-vector population which transmit diseases like cholera, typhoid, meningitis, etc.

Untreated human excreta is a health hazard which causes soil pollution and water pollution also. The river water and groundwater are sources of water for drinking for many people. So, the contaminated water can spread many diseases especially water-borne.

### **Vermi-processing Toilets**

In the vermi-processing toilets, human excreta is treated by earthworms in a pit. The earthworms usually eat up all organic matter present in human excrete and turn it into compost. These are low water use toilets for the safe processing of human.

### **Alternate Arrangement for Sewage Disposal**

Low cost outside the sewage disposal system has been developed to take care of places where there is no sewage system, e.g. rural areas, isolated buildings. These are described below:

**(i) Septic tanks:** Septic tank is a low-cost onsite sewage disposal system. Septic tanks are suitable where there is no sewerage made. These tanks need cleaning every four to six months.

A septic tank usually consists of a big, covered underground tank made of concrete having an inlet pipe at one end and an outlet pipe at the other end. The toilet seat is connected to the inlet pipe of the septic tank. The human excreta from the toilet seat enters into the septic tank through the inlet pipe. The solid part of excreta keeps on collecting at the bottom of the septic tank in the form of a sludge whereas watery waste remains above it.

The anaerobic bacteria breakdown most of the solid organic matter present in human excreta due to which the volume of solid waste is reduced too much. The digested solid waste keeps on depositing at the bottom of septic tank. The watery waste is also cleaned by anaerobic bacteria. The excess water goes out of the septic tank through the outlet pipe and get absorbed in soil.

**(ii) Composting pits:** These are self-sustained human waste disposal units which is not connected to a sewer line or a septic tank. A composting toilet breaks down and dehydrates human waste to compost.

**(iii) Chemical toilets:** These toilets have limited storage capacity for human waste and need to be emptied periodically.



These are the toilets which use chemically treated reservoir located just below the toilet seats. The chemicals reduce the foul smell coming out of human excrete and carry out partial disinfection of human waste.

### **Sanitation at Public Places**

In our country, fairs are organised periodically. A large number of people participate in them. In the same way, railway stations, bus depots, airports, hospitals are very busy places. Thousands of people visit them daily which generate large amount of waste. It must be disposed of properly otherwise epidemics could break out. The government has laid down certain standards of sanitation but unfortunately, they are not strictly enforced. We should not scatter litter anywhere. If there is no dustbin in sight, we should carry the litter at home and throw it in the dustbin.

### **Conclusion**

We all have a role to play in keeping our environment clean and healthy. We must realise our responsibility in maintaining the water sources in a healthy state. Adopting good sanitation practices should be our way of life. As an agent of change your individual initiative will make a great difference. Influence others with your energy ideas and optimum, A lot can be done if people work together. There is great power in collective action.

As an active citizen, we have many responsibilities regarding sanitation. These can be listed as follows:

- To ensure that our surroundings are clean.
- To ensure that the sewerage system in our house is properly managed.

- If any leakage or an open drain in the sewerage system is present, then it should be reported to the municipality or the gram panchayats to insist that the open drain must be covered properly and several air and water-borne diseases can be prevented.

**Note:** Mahatma Gandhi said, 'No one needs to wait for anyone else to adopt a humane and enlightened course of action'.

