

# Waste Water Story 19

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## WASTE WATER

Water is one of the basic necessities of life. It is impossible to imagine doing our daily chores like cooking, washing dishes or clothes, bathing or even using the toilet without water. Everyday most of us use at least a hundred litres of water and most of the waste water ends up in a drain.

In this chapter, you will learn about the dirty waste water which is produced in kitchens, bathrooms, while washing cars of your bicycles and industrial wastes. What happens to this dirty waste water in your homes ? Where do you think that rainwater runs to from the streets ? What happens to waste chemicals and other materials from factories ? Are there any harmful effects of the waste water ?

Water is essential for life on earth. No known organism can live without it. Being a precious resource of nature, it should not be contaminated polluted and wasted for any reason. However, for centuries, water bodies have been used as a dumping ground for human sewage and industrial wastes.

Dirty waters or waste waters can be classified by their, origin as domestic waste water and industrial waste water. Any combination of waste water that is collected in municipal sewage. Municipal sewage is conducted outside the city/town/metropolitan by open or closed drainage. Domestic

waste water is that which is discharged from residential and commercial establishments. The pollutants in domestic waste water arise from residential and commercial cleaning operations, laundry, food preparation, body cleaning functions and body exertions (i.e. urine and faeces).

Normally, wastewaters are conducted to treatment plants for removing undesirable components which include both organic and inorganic matter as well as soluble and insoluble material. These pollutants, if discharged directly or with improper treatment, can interfere with the self-cleaning mechanisms of water bodies such as the Ganga river. The capacity for self-cleaning is due to the presence of relatively small numbers of different types of micro-organisms in the water bodies. These micro-organisms in the water bodies produce new cells also. But often, either a pollutant does not degrade naturally or the sheer volume of the pollutant discharged is sufficient to overwhelm the self cleaning process. Also, the microbial pollution can be destroyed by toxic wastes build-up and reach levels that would be high enough to prevent re-establishment of a microbial population. The water quality of a water body, thus, becomes permanently degraded.



Water treatment project

## What does Waste Water Contain?

The waste water from your home contains used water made up of soap, food particles, toothpaste, bits of paper, strands of hair, traces of oil, dust, urine and human excreta. During monsoon, rainwater also gets into the drains and adds silt, pebbles, leaves and other plant materials to the waste water. The waste water flowing through the drainage pipes is called sewage.



A river polluted by sewage

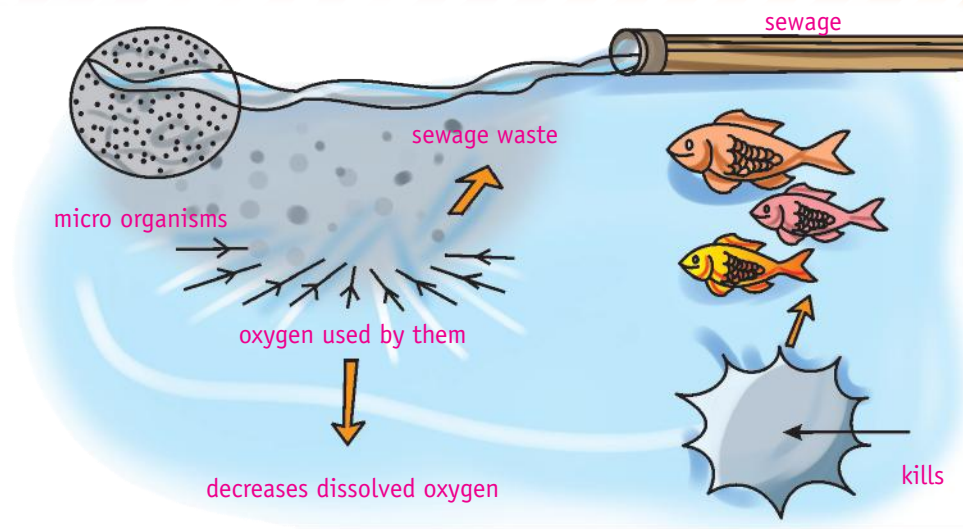
## How does Sewage Harm Aquatic Life?

Household sewage contains organic waste materials like human excreta, urine and food particles. These wastes provide nutrients for micro-organisms. If sewage water is released into a lake or river, micro-organisms like bacteria, fungi and algae grow in large numbers. These organisms obtain nutrients by decomposing organic waste. To decompose waste, micro-organisms use oxygen dissolved in water.

A large population of micro-organisms in a water body would decrease the amount of dissolved oxygen in the water. They would also block sunlight due to which aquatic plants further reduces the amount of oxygen in the water.

Most aquatic animals use oxygen dissolved in the water to live. Once the level of dissolved oxygen falls, fish and most other aquatic animals also begin to die.

Every city and town produces a huge amount of sewage. Can we let sewage water to directly flow into water bodies, it would pollute these sources. Such water from lakes and rivers will not be suitable for human consumption or for growing crops. It will also harm all kinds of plants and animals living in these waters.



Effects of sewage on aquatic life

### Do You Know?

It has been suggested that we should plant eucalyptus trees all along sewage ponds. These trees absorb all surplus waste water rapidly and release pure water vapour into the atmosphere.

## What should You do to Control Sewage?

Following are a few measures that you can adopt to control generation of sewage :

- Use flushes with low capacity.
- Never pour household products such as cleansers, beauty products, medicine, automobile oil and paint down the drain. These, contain chemicals which the wastewater treatment plants may not be able to remove. These should be properly disposed.
- Excess cooking oil, butter, meat fats and plastic should be disposed off in the garbage can. These materials can clog pipes and could cause sewage to overflow in your home or in public areas.
- Fix leakages in your sewer pipes. You will not want sewage to contaminate your drinking water, will you ? It can also flow into your yard and be the breeding place of disease-causing insects such as flies, cockroaches and mosquitoes.

A city or a town produces millions of litres of waste water everyday. You have learnt that only 2% of the total water on the surface of the earth is freshwater. When freshwater is scarce, such huge amounts of water cannot be wasted. The water that flows through the drains is taken to a sewage treatment plant, where it is cleaned. This water can be used for various purposes.

## How is Waste Water Treated in Sewage Treatment Plant?

Waste water is treated using a series of physical and chemical treatments.

## Removal of Large Solids from the Sewage

The sewage reaches a sewage treatment plant through a network of pipes. The waste water is made to pass through screens which separate solids such as pieces of stones, wood, plastics, glass and metal.

## Sedimentation of Waste from Water

After passing the waste water through the screens, it is transferred to large tanks where it is allowed to settle for 8-12 hours. During this period, most of the organic waste such as human excreta settles at the bottom of the tank. This type of waste is called sludge. Sludge is a watery mixture of organic waste.

The sludge from the settlement tank is shifted to another tank called the digester where it is converted into manure or burnt and used as landfill.

## Decomposition of Organic Matter

After separating the sludge from the sewage, the waster is transferred into large tanks where air along with micro-organisms is bubbled into the tank. The waste water is held in the aerated tanks for 48 hours.

During this period, the micro-organisms decompose most of the organic matter still present in the sewage. Decomposition breaks down waste matter into harmless substances. Oxygen in the air is used by the micro-organisms to respire.

## FINAL SEPARATION OF SEDIMENTS AND CHEMICAL TREATMENT

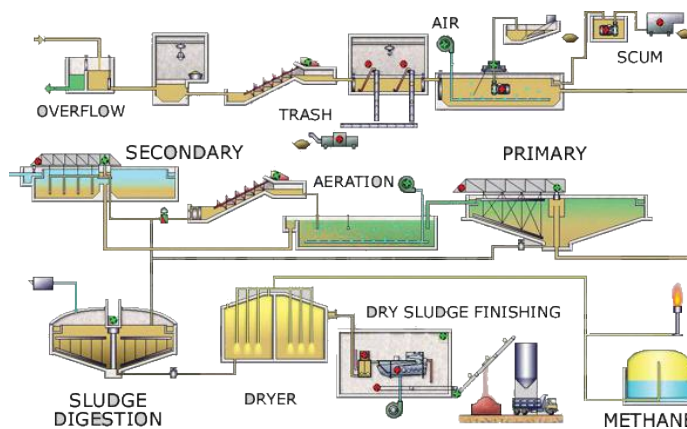
Now the waste water is transferred to a large tank where the decomposed waste settles at the bottom. These tanks too are called sedimentation tanks. After allowing enough time for the solids to settle, the waste water is drained out from the tanks. At this stage, most of the solid substances from the water are removed.

The water is then shifted to a tank where it is treated with chlorine to kill all the micro-organisms present in the waste water. The dirty water that was brought to the sewage treatment plant is now absolutely clean and can be used to cultivate crops, maintain large gardens and manufacture goods in industries.

The water can also be discharged into oceans rivers and lakes or used to recharge groundwater.



A waste water treatment plant



Mechanism of a waste water or sewage treatment plant



## Activity Time

### Demonstrate the working of a wastewater treatment plant.

#### Step 1

First prepare a filter by using a 2 litre bottle with its bottom cut. Turn the bottle upside down. Loosely put a cotton plug in the neck of the bottle. Pour fine sand over the cotton plug followed by activated charcoal, coarse sand, fine gravel, and coarse gravel. This acts as a filter by slowly pouring 4-8 litres of clean tap water.

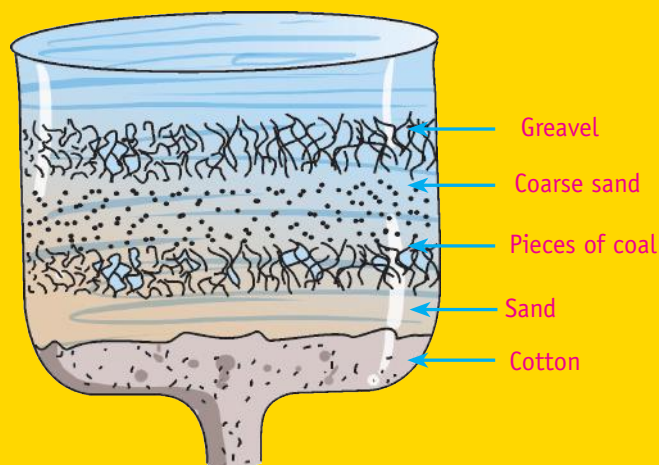
#### Step 2

Prepare some dirty water by adding 1 cup of soil or mud to two litres of water in a bottle.

#### Step 3

Shake the bottle, this helps in aeration. Collect a small amount of the dirty water and label it as water before treatment.

Continue the aeration process by pouring the water back and forth between two bottles 10 times. Do you find any change in the colour? Collect a portion of this aerated water and label it as water after aeration.



Wastewater treatment (filtration)

#### Step 4

Add two table spoons of alum (phitkari) to this. Stir the mixture slowly for 5 minutes. After sometime you will observe some precipitate like substance (coagulation) in the water.

#### Step 5

Allow the water to stand undisturbed for 20 minutes. Observe the water at 5 minute intervals. You will find the precipitate formed starts settling down (sedimentation).

#### Step 6

Without disturbing the sediment, pour the top clear portion of water through the filter model prepared earlier (filtration).

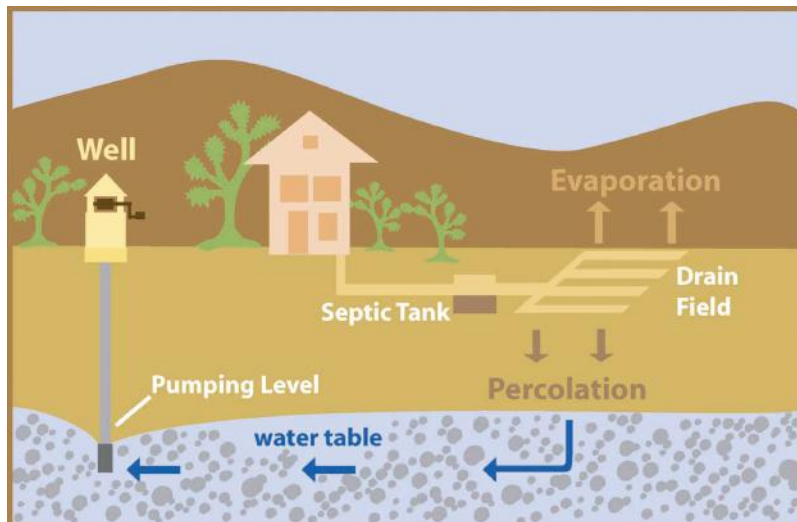
#### Step 7

After you have collected more than half of the water poured through the filter, add two chlorine tablets to the filtered water (chlorination).

Compare the treated and untreated water. What was the effect of adding chlorine on the colour and odour of the filtered water?

## Septic Tank : An Alternate Arrangement for Sewage Disposal

Many villages in our country are still not connected to a common sewage treatment plant. In such places, a septic tank is used to treat household sewage. A large concrete tank is built under the ground with inlet and outlet pipes attached to it. The inlet pipe carries the household sewage to the tank. The solid matter from the sewage settles at the bottom of the tank. Bacteria present in the tank decompose the solid waste. The excess water flows out of the tank through the outlet pipe into the soil. The decomposed solid matter must be removed from the tank periodically.



A septic tank

A septic tank, is an onsite mini sewage treatment plant. It is suitable for places having sandy soil, as the outlet pipe gets blocked in clayey soil. A cluster of four to five houses can install and maintain a common septic tank. With a few modifications, a septic tank can be converted into an efficient biogas plant.

## CHEMICAL TOILETS

A chemical toilet uses chemicals to disinfect the waste. These toilets are most commonly found in aircrafts. A simple chemical toilet consists of a seat on a container and deodorise the waste.

## Lack of Sanitation can Spread Diseases

Many people in our country do not have access to sanitation facilities. They use open places such as railway tracks, fields, dry river beds and playgrounds to defecate. Human excreta left on the land can contaminate water sources like rivers, lakes, ponds and even groundwater. The contamination can cause water-borne diseases such as cholera, typhoid, hepatitis and dysentery.

In some towns and cities, there are open drainage systems. An open drainage system is a health hazard. It is not only a breeding place for mosquitoes and flies but also spreads water-borne diseases and contaminates water sources during monsoons.



Open drainages, a serious health hazard



## Activity Time

Make two pits within the soil. In one pit, bury vegetable remains, while in the other put polythene bags.

Cover the pits properly and leave them undisturbed.

Dig these pits again after approximately two months and observe the buried materials.

Did you find any strange results ?

Can you find out the reasons for your observations.

### Do not :

- Let waste like tea, food particles, oil paints, oil residue, paper flow into the household sewage system.
- burn used or leftover waste products in your garden.
- pour chemicals into drains, they pollute soil and water.
- pour leftover pesticides into drains because they can pollute groundwater.
- rinse pesticide containers near a water source including wells, ponds and rivers.



### Know the Keywords :

Waste water : Dirty water.

Garbage : Rubbish or foul.

Sewage : Waste matter conveyed in sewers.

Decompose : Cause to decay or rot.

Sludge : Muddy sediment.

Sewer : A pipe line for carrying off drainage water and sewage.



### Point to Remember

- The waste water from your home contains used water made up of soap, food particles, toothpaste, bits of paper strands of hair, traces of oil, dust, urine and human excrete.
- Oxygen in the air is used by the micro-organisms to respire.
- The waste water is transferred to the large tank where the decomposed waste settles at the bottom. These tanks too are called sedimentation.
- A chemical toilet uses chemicals to disinfect the waste.

## EXERCISE TIME

### A. Answer the following questions :

1. What does waste water contain ?
2. What does the waste water from your home contain ?
3. What can you do to control sewage ?
4. Enlist the waste that should not be allowed to flow into the drain.
5. How is household waste carried to the waste water treatment plant ?
6. How are stones and pieces of wood removed from the sewage in a sewage treatment plant ?
7. What is the use of sedimentation tanks in a waste water treatment plant ?
8. Why is air along with micro-organisms bubbled into the sewage treatment tanks ?
9. Why does untreated waste water kill fish ?

### B. Write 'T' for true and 'F' for false statements :

1. A septic tank can be used to produce biogas.
2. A septic tank does not need any maintenance.
3. A chemical toilet is used in a chemical factory.
4. A septic tank is installed in an aircraft.
5. A chemical toilet is a small tub in which chemical are used to disinfect waste.
6. Defecating in the open can spread diseases and pollute water bodies.
7. The water treated in the treatment plant is not clean and is drained into the sea.
8. If untreated waste water is allowed to flow into lakes, it will heat the lake water.
9. A septic tank must be intalled near a well to keep it clean.
10. We should pour left one-pesticides into the drains.

### C. Tick (✓) the correct option :

1. Everyday we use \_\_\_\_\_ litres of water.  
(i) 100  (ii) 200  (iii) 300
2. The water which is discharged from residential and commercial establishment is called.  
(i) domestic waste water   
(ii) industrial waste water   
(iii) mercipal sewage





# Model Test Paper-1

## Based on Chapters 1 to 9

### A. Answer the following questions :

1. What is nutrition?
2. Why do only leaves make food ?
3. How are proteins in our food digested ?
4. What is silk ?
5. How do we get silk thread from silk worms ?
6. What is heat? Write the effects of it ?
7. Why do we prefer white clothes in summer season ?
8. What are insulators? Give three examples.
9. Write any two chemical properties of bases.
10. What are mineral and organic acids?
11. What is chemical change ?
12. What is earthquake? Write all precautions against it.

### B. Fill in the blanks :

1. Heavy rainfall results in \_\_\_\_\_.
2. The chlorophyll in the leaf cells absorbs\_\_\_\_\_.
3. Leaves are the \_\_\_\_\_ of plants.
4. Bile helps in the digestion of \_\_\_\_\_ .
5. The \_\_\_\_\_ is a bag like organ made up of muscles.
6. Yak wool is common in \_\_\_\_\_ and \_\_\_\_\_.
7. Heat is a form of \_\_\_\_\_.
8. Conduction takes place in \_\_\_\_\_.

### C. Match the following :

#### Column 'A'

1. Red eyed frog
2. Monkey
3. Lion tailed macaque
4. Toucan

#### Column 'B'

- (i) long, large beak
- (ii) stick pad
- (iii) bread ape
- (iv) long tail

**D. Write 'T' for true and 'F' for false statements :**

1. A carnivorous plant is a heterotroph.
2. Shearing hurts the animals.
3. Mercury is shiny liquid.
4. Burning of paper is physical change.
5. A total parasitic plant has some chlorophyll.

**E. Tick (✓) the correct option :**

1. Saliva contains a digestive enzyme called :  
(i) bile  (ii) pepsin  (iii) amylase
2. Angora goat are found in Turkey and :  
(i) Pakistan  (ii) Kashmir  (iii) Ankora
3. Bodies that do not conduct heat are called :  
(i) Conductors  (ii) Insulators  (iii) none of them
4. A base reacts with an acid to form :  
(i) water  (ii) salt  (iii) rust
5. Copper sulphate is called neela :  
(i) salt  (ii) thotha  (iii) shertha
6. Shaking of earth's crust causes :  
(i) floods  (ii) cyclons  (iii) earthquakes

**F. Classify the characteristics of animals which is adapted by polar region or tropical rain forest animals :**

1. White deer \_\_\_\_\_
2. Strong tail \_\_\_\_\_
3. Need to migrate \_\_\_\_\_

**G. Classify the changes as physical or chemical changes :**

1. Melting of wax
2. Photosynthesis
3. Burning of candle

## Based on Chapters 10 to 19

### A. Answer the following questions :

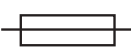

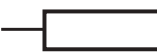


1. What is soil profile?
2. How do leaves respire ?
3. What is aerobic respiration?
4. What do you mean by circulation?
5. How do ferns produce?
6. What is a simple pendulum and what is its use ?
7. Explain the working of a simple electric bell ?
8. What is MCB.
9. What are real and virtual images?
10. Why is the ground water depleting?
11. What is afforestation ?
12. What can you do to control sewage?

### B. Fill in the blanks :

1. A large muscular sheet is called \_\_\_\_\_.
2. Leaves respire through \_\_\_\_\_.
3. \_\_\_\_\_ is a pigment which carries oxygen.
4. Bile pigments impart \_\_\_\_\_ colour to urine.
5. The \_\_\_\_\_ develops inside the ovule.
6. \_\_\_\_\_ is used to measure speed.
7. An electric bell has an \_\_\_\_\_.
8. An \_\_\_\_\_ lens always forms a virtual image of an object.

### C. Match the following :

#### Column 'A'

1. 
2. 
3. 
4. 
5. 

#### Column 'B'

- (i) Socket
- (ii) Plug
- (iii) Fuse
- (iv) Heater
- (v) A wire joint

**D. Write 'T' for true and 'F' for false statements :**

1. Fishes respire through their lungs.
2. Water is a non-renewable natural resource.
3. Check dams prevent the flow of water.
4. A septic tank can be used to produce biogas.
5. We should pour left over-pesticides into drains .
6. Leaves respire through stomata .

**E. Tick (✓) the correct option :**

1. Which of these has the smallest size of particles?  
(i) silt  (ii) sand  (iii) gravel
2. When we breathe in air the diaphragm goes :  
(i) up  (ii) low  (iii) down
3. The number of chambers present in human heart are :  
(i) 2  (ii) 4  (iii) 6
4. Galilio is an \_\_\_\_\_ scientist :  
(i) Indian  (ii) Italian  (iii) none of them
5. To measure voltage we use :  
(i) ammeter  (ii) voltmeter  (iii) circuit
6. Which of the following is not a luminous body :  
(i) sun  (ii) moon  (iii) both of them

**F. Give reasons :**

1. Sandy soil is not suitable for growing crops.
2. Deep wells have clean water.
3. Humus is beneficial to plants.