

## CHAPTER-12 : WATER AND AIR

### A. Answer the following questions :

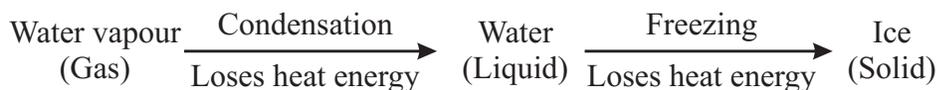
1. **Three states of water** : Water exists in three different forms—solid (ice), liquid (water) and gas (water vapour).

**Liquid (water)** : Between 0°C and 100°C, water exists in its liquid state (which is its natural state.) This may be present as groundwater in underground aquifers or as surface water in ponds, river and lakes. Seas, oceans and hot springs are also forms of liquid water.

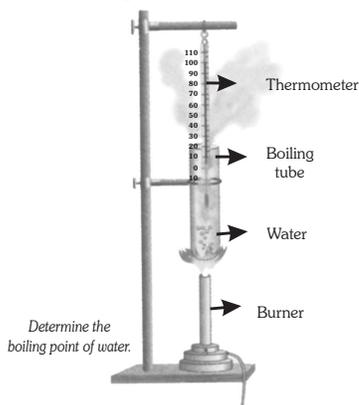
**Solid (ice)** : Water below 0°C is ice. Glaciers are large sheets of slowly moving ice that are found in regions of high snowfall. Glaciers, icecaps and icebergs are solid forms of water.

**Gas (water-vapour)** : Water-vapour found in the atmosphere is the gaseous form of water.

A word diagram showing interchangeability of these states is as follows.



2. Water starts boiling at 100°C and this temperature is known as boiling point of water.



#### To determine the boiling point of water.

Clamp a boiling tube containing 5ml of water on an iron stand. Set a thermometer in it as shown.

Heat the boiling tube on a low flame until the water starts boiling. Observe the temperature for a few minutes. The temperature during boiling of water remains constant 100°C.

3. Rainwater harvesting is a method of direct collection of rainwater from roof tops of buildings. It can be done both on the roof tops of our houses as well as of industries.

The rainwater collected can be stored for direct use or can be allowed to reach the groundwater. Once the water reaches the groundwater, water table is raised. Rainwater harvesting is, therefore, a solution to the problem of depleting groundwater.

Holding moisture in the loose soil (catchment areas) surrounding rain-water harvesting structures prevents it, first of all, from being blown away and eroded leading to degradation. The expanse of such areas could be then used for agriculture and the water saved could be utilised to meet the needs of immediate as well as far off areas.

4. Rainfall and snowfall are the main sources of water. This water gets collected in different water reservoirs. Some of such reservoirs are as follows.

**Seas and oceans :** Seas and oceans are the largest reservoirs of natural water. Seawater has a large amount of salts dissolved in it. This makes it unfit for drinking or for irrigation purposes.

**Rivers :** The rivers receive water through rainfall or snowfall. Rain water and snow water flows down the hills to reach the rivers. The river may originate from a glacier or a spring.

The river water contains disease causing germs, mud, clay, sand and soluble salts, It is cleaned thoroughly before it is sent to homes. The river water finally flows into seas or oceans.

**Springs :** Rain water collects over the impervious rocks under the earth. This water exerts pressure and flows out as a spring. Spring water usually contains dissolved salts and minerals but is free from suspended impurities.

**Lakes :** A lake is a body of water that is surrounded by land. Lakes are formed in a variety of ways. Glaciers depressions of the earth to form lakes. Lakes are home to a large variety of aquatic life. Lakes can be both, natural of man made.

5. During the day time the surface of ocean becomes hot and it make the air warm and moist. You know that the warm air is light and rises up. As warm, moist air from the ocean surface begins to rise, it encounters cooler air. This cooler air causes the warm water vapour to condense and to form storm clouds and drops of rain. Due to condensation latent heat (changing phase at constant temperature and pressure) is released which warms the cool air above, causing it to rise and thus making way for more warm humid air from the ocean below.



Hurricane

As this cycle continues, more warm moist air is drawn into the developing storm and more that is transferred from the surface of the ocean to the atmosphere.

This continuing heat exchange creates a wind pattern that spirals around relatively calm centre like water swirling down a drain. This wind pattern may turn into hurricane. A tropical storm becomes a hurricane when its wind speed exceeds 118 km/h.

**Frequency and severity of hurricanes :** Human activity like deforestation, greenhouse gas emissions from a wide range of industrial and agricultural processes etc. are contributing to global warming and hence air and water temperatures are rising worldwide. This makes it easier for hurricanes to form and gain destructive force.

If the atmospheric levels of greenhouse gases is not checked this will lead to more frequent and severe hurricanes in the future.

6. **Wind direction indicators :** A *windvane* is a tool used to tell which direction the wind is coming from. These are usually found on top of buildings so that they catch an open breeze. The part of the vane which turns is usually shaped in the form of an arrow.

The arrow tells the direction of the wind. The other end is wide so

that it can even catch the smallest of breeze. A windvane is the oldest weather tool which is still used. It can measure wind direction up to only a few metres off the ground.

Similarly, the masthead device for sailboats that indicated apparent wind direction composed of rotating wind vane and a protractor arm encompassing multiple reference marks. These marks can be adjusted with greater compass accuracy to allow several settings in each quadrant creating a series of reference point enabling one to more accurately determine the apparent wind angle from a centre point, and thus optimize sail trim, heading and boat speed.

7. Storms are a major hazard, that may cause considerable loss of life and damage to property.
  1. Winds with great speed destroy buildings, blow away roof of houses and other light infrastructure, uproot trees, damage crops, disrupt telephone and electricity power supply.
  2. Flooding is caused by torrential rains and is a major cause of deaths.
  3. Storm surges associated with tropical cyclones : Storm surge is a rapid rise of sea level caused by the terrific winds of a tropical cyclone, pushing sea water on to a windward coast. They may be as high as 20 metres. These storm surges are the main cause of devastation of property and life.
  4. Landslides occur where heavy rainfalls wash away buildings erected on steep, unstable slopes.
8. You must have noticed that the wings of birds and planes are sucked upwards and why a piece of paper goes up when you blow over it ? This is due to the 'lift' created by the moving air. This is called *Bernoulli effect*. Consider the wings of a bird as an aeroplane's. The curved surface of the wing of a bird or an  Daniel Bernoulli aeroplane causes the air to move faster over the top of the wing than the bottom. The faster moving air has less push (pressure) than the slower moving air on the bottom of the wing. The greater pressure underneath pushes the wing upwards. This effect is called Bernoulli effect. The difference in pressure creates a lift to hold the aeroplane or the bird aloft.
9. We should take the following steps when a severe storm strikes :
  - (i) We should stay inside and shelter well clear of windows, door and skylights.
  - (ii) If the building starts to break up, we should try to seek shelter in the strongest part like the cellar, internal room, hallway, or built-in wardrobe. We can even hide under a mattress, doona, or a strong table or bench.
  - (iii) If driving we should try to immediately stop at a place which is clear of trees, power lines and streams.
10. When scarcity occurs when demand for water exceeds supply due to natural causes, population growth or practices that utilise excessive amount of water.

### Causes of water scarcity

- (i) Agriculture is the largest uses of fresh water. At present, most of the total fresh water on the earth is used to provide food, natural fibres and implement to billions of rural dwellers.
  - (ii) Natural causes such as floods, droughts and other effects of climatic changes add to the problem of water scarcity.
  - (iii) Industrialisation and urbanisation have produced large volumes of effluent wastewater discharged in many cases into waterways that carry fresh water.
  - (iv) Modernisation of agriculture has resulted in massive increase in the use of fertilisers with residues being discharged into rivers, lakes and groundwater.
11. It is predicted that by 2050 about two-thirds of the world population, will face moderate to severe water scarcity. Water scarcity affected people and the environment in the following ways :
- (i) People lack in accessing clean drinking water.
  - (ii) Water scarcity affects rain-fed and irrigated agriculture and directly on it for their incomes.
  - (iii) Water scarcity due to poor farming water management has resulted in water logging and increase soil salinity, particularly in the arid and semi-arid regions.
12. The purpose of water conservation is to increase the amount of clean water available. Some of the methods of water conservation are as follows :
- ◆ Using less water avoiding wastage at home.
  - ◆ Effective flood control, specially by building dams and reservoirs.
  - ◆ Using better methods of irrigation, such as drip irrigation, in which water is supplied to the root or plants drop by drop instead of filling the entire field with water.
  - ◆ Recycling of water in factories and using it several times before it is disposed off.
  - ◆ Treating sewage and factory wastes before disposing them off so that water sources are not polluted.
  - ◆ Soil conservation methods, such as planting trees, also increase the supply of groundwater.
  - ◆ Using biodegradable fertilizers and pesticides.
  - ◆ Rainwater harvesting is being encouraged by the government these days as on important method of conserving groundwater.

### B. Fill in the blanks :

- |                             |                    |                |
|-----------------------------|--------------------|----------------|
| 1. gaseous                  | 2. 0°C             | 3. depleting   |
| 4. rainfall, snowfall       | 5. salts, minerals | 6. seeps       |
| 7. masthead, arm, reference |                    | 8. lift, aloft |

### C. Define the following :

1. There is a lot of water hidden under the ground. This is called groundwater.

2. Glaciers are rivers of slow moving ice that form when it is too cold for snow to melt.
3. The level of groundwater is called water table.
4. An anemometer is a device that accurately tells how fast the wind is blowing.

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

1. T
2. T
3. F
4. F
5. T

**E. Tick (✓) the correct options :**

1. b
2. a
3. c
4. b
5. c

**CHAPTER 13 : FOREST**

**A. Answer the following questions :**

1. Forests are often referred to as the lungs of the earth because just as our own lungs absorb carbon dioxide from the blood and infuse it with oxygen. Green plants absorb carbon dioxide during photosynthesis and release oxygen into the atmosphere in turn.
2. **Kinds of Forests :**
  - (i) **Evergreen forests :** Forests that remain green throughout the year, are called evergreen forests. The trees of these forests do not shed all their leaves at any particular time of the year. The trees are tall and have huge crowns. They are so thick that the rays of the sun cannot pass through them. Most of the trees found here are hard wood trees and some of the common ones are rosewood, mahogany, sandalwood and bamboo. They are found along the western ghats and in the north-eastern parts of India (e.g., Assam, Meghalaya and Mizoram).
  - (ii) **Deciduous forests :** Deciduous forests are forests where the trees shed their leaves every year, usually in autumn. Such trees are *teak*, *sal*, *sheesham*, and *sakhua*. They grow in areas having hot and wet climate, and where the rainfall is moderate. These forests are found on the hills of the southern plateau and on the foothills of the Himalayas.
  - (iii) **Coniferous forests :** Trees that bear cones are called coniferous trees. The *chir* and *deodar* are such trees. They grow in very cold regions. Thick coniferous forests are found on the higher slopes of the Himalayas and the Nilgiris.
  - (iv) **Marshy forests :** The forests found on the deltas of rivers are called marshy forests. For example, in West Bengal there are thick forests on the delta of the river Ganga. They are also called *sundarbans*.
  - (v) **Thorny forests :** In India, we have thorny forests in the dry regions of Rajasthan, Punjab, central Maharashtra, east Karnataka and Gujarat. Trees like *babul*, *keekar*, *thohar* and *khair* grow in these places.
3. The products that we obtain from the forests are :
  - (i) Timber, firewood, pulp, lac, resins, gum, herbs, grasses and leaves.

- (ii) Raw materials or food, fuel, shelter and medicines.
  - (iii) Wood that is used as a raw material in the paper industry.
  - (iv) Vegetables, fruits, fibers, grasses, essential oils, gums, resins, drugs and spices.
  - (v) Spices for example cinnamon (dalchini) and cardamom (elaichi).
4. **Forests are important because of the following :**
- (i) Wood obtained from plants is used as a raw material in the paper industry.
  - (ii) Spices used in cooking are also plant products.
  - (iii) Several fruits, flowers, leaves and tubers are also obtained from forests.
  - (iv) Camphor and pine are used to make soaps, cosmetics, confectionery and incense.
  - (v) Fibres of cotton and jute are used for making fabrics and other products such as bags, mats, etc.
  - (vi) Coconut is used for making ropes, mats and carpets and is obtained from the outer covering of the coconut.
  - (vii) Rubber is used for making tyres, rubber bands, erasers etc.
  - (viii) We get medicines from amla, isabgol, neem, tulsi, and cinchona. Example, the bark of the cinchona tree yields quinine, which is used to cure malaria.
  - (ix) Forests prevent soil from being washed away with water or blown away with wind by holding it together in their roots.
  - (x) Forests control floods by holding water in roots.
  - (xi) Through transpiration, i.e., evaporation of water from the surface of leaves, forests make it possible for water vapour to reach the atmosphere in large quantities. These water vapour then forms clouds and leads to rain.
  - (xii) A good forest cover attracts tourists from all over the world they may come for recreation, peace, research, extensive study or a variety of other purposes. This leads to generation of income and great foreign exchange earnings by a country, thus they lead to progress in the economy.
5. **Components of forests :** Forests are made up of living and non-living components. The non-living or the abiotic components of a forest includes water, nutrient, rocks, sunlight and air.  
The living or the biotic components are wildlife, trees, shrubs, herbs, ferns, fungi and the micro-organisms.
6. The inter dependence between producers and consumers is studied in form of various linkages that appear as a chain and thus are called a food chain.  
Examples :
- (i) Grass → Rabbit → Fox → Lion
  - (ii) Grass → grasshopper → Frog → snake → eagle
  - (iii) Grass → goat → human being

- (iv) Plant → deer → tiger
  - (v) Leaves → Caterpillar → bird → cat
7. Losses occur at every link of the chain as energy is transferred through the food chain because from the food eaten by an organism utilizes energy provided by it for its own various life processes. Thus, this energy is utilized to carry out growth, repair and reproduction. An organism also passes out undigested food as faeces which also leads to energy loss in the transfer process. Only a very small amount of energy which is stored in the body is transferred to the next level.
8. **Some important consequences of destruction of forests have.**
- (i) The indiscriminate cutting of forests has led to loss of many plants and trees which have provided man with herbs, medicines, fruits, gums, resins, timber, etc. to name just a few.
  - (ii) Once the plants and trees in the forest are destroyed it would lead to the decline of animal populations as their habitats are destroyed. Soon the entire ecosystem will be destroyed.
  - (iii) Once the forest cover is removed, the soil becomes exposed to the rain and wind. This causes the loss of mineral salts from the soil. The soil eventually becomes less fertile.
  - (iv) The soil is now easily washed away by the rain. This causes landslides.
  - (v) Soil that is washed into rivers and lakes causes these waterways to become shallower. This increases the risk of flooding during heavy rains.
  - (vi) We have also read that plants effect the hydrological cycle in a number of ways. Deforestation can result in a change in quantity of water on the earth. As there is less rainfall, there is a shortage of surface water and underground water leading to water shortage. This reduces the availability of drinking water and water for irrigation.
9. The following steps must be undertaken to conserve forests :
- (i) **Afforestation** : Afforestation is the practice of renewing a forest by planting trees on a large scale. Forests can be conserved by striking a balance between planned cutting of trees (block-cutting) and afforestation.
  - (ii) **Block-cutting** : Block-cutting refers to cutting down of trees in a specified part of the forest while trees are planted in an adjacent area of the same size. This practice of deforestation and afforestation is carried out annually as a result of which a sustained supply of timber or any other forest product is obtained every year without affecting the size of the forest.
  - (iii) **Preventing overgrazing** : Overgrazing by cattle, horses and sheep must be prevented. Herbivores not only destroy grasslands but also eat up the lower branches of trees.

- (iv) **Protection from diseases and pests** : Serious diseases of forest trees like rust, smut, wilt and mosaic are caused by microbes like fungi, bacteria and viruses. In addition, many insects and pests damage forest trees. Diseases and pests can be controlled by removing infected trees, spraying pesticides and growing disease and pest-resistant varieties of forest trees.
- (v) **Preventing forest fires** : Man-made forest fires are believed to have caused extinction of several species in the past. Callousness of local people may cause irreparable damage to forests. People must refrain from lighting bonfire or even lighting a match in forests.

**B. Define the following :**

1. **Interdependence** : Interdependence means the ways in which living organisms (plants and animals) depend on each other in order to remain alive.
2. **Energy flow** : The process of transfer of energy from producers to consumers and finally to decomposers is called energy flow.
3. **Forest Conservation** : The maintenance and upkeep of forests is called forest conservation.

**C. Differentiate between the following :**

1.	Food Chain	Food Web
	<p>The interdependence between producers and consumers is studied in form of various linkages that appear as a chain and thus are called a food chain.</p> <p>Example,</p> <pre> graph TD     Grass --&gt; grasshopper     Grass --&gt; frog     grasshopper --&gt; snake     frog --&gt; snake     snake --&gt; eagle           </pre>	<p>The network of interconnected food chains is called food web.</p> <p>Example,</p> <pre> graph TD     Grass --&gt; goat     Grass --&gt; deer     Grass --&gt; grasshopper     Grass --&gt; beetle     goat --&gt; tiger     deer --&gt; tiger     grasshopper --&gt; frog     beetle --&gt; frog     frog --&gt; snake     snake --&gt; eagle           </pre>
2.	Producers	Consumers
	Plants are known as producers because they trap sunlight for preparing food by the process of photosynthesis. No other living being can make their own food.	Organisms that depend directly or indirectly on plants for their food are consumers.

3.	Secondary Consumers	Tertiary Consumers
	An animal that feeds on a primary consumer (herbivore) is called secondary consumer (a carnivore)	An animal that feeds on a secondary consumer (carnivore) is called tertiary consumers.

**D. Fill in the blanks :**

- |                           |                   |
|---------------------------|-------------------|
| 1. Himalayas, Nilgiris    | 2. Transpiration  |
| 3. Food chains, Food webs | 4. Replenishment  |
| 5. Herbivores             | 6. Bonfire, Match |

**E. Match the columns :**

- |      |      |      |
|------|------|------|
| 1. d | 2. f | 3. a |
| 4. b | 5. c | 6. e |

**CHAPTER-14 : WASTE MANAGEMENT**

**A. Answer the following questions :**

1. *Sewage* is the waste water from homes (domestic liquid waste) as well as from industries.

Its main sources are—

- Human excreta (faeces and urine), soaps, detergents and other liquid wastes from kitchens and toilets.
  - Industrial wastes include industrial liquid waste that comes from different industries. Agricultural industries, tanneries, distilleries, petroleum refineries, chemical industries and other industries, let out liquid wastes containing harmful chemicals, and disease-causing germs.
  - Debris from roads and pathways which enter the sewage.
  - Agricultural because of excessive water usage that gets drained into lakes, rivers and oceans. Such a liquid waste contains fertilizers, pesticides, insecticides and at times even animal wastes.
2. In urban areas the sewage is collected through the pipelines that connect building to horizontal mains. The sewer mains then connect to larger mains, and then send to the waste water treatment site. Vertical pipes, called manholes connect the mains to the surface. Sewers are generally gravity powdered, though pumps may be used if necessary.
3. *Storm sewers* are large pipes that drain excess rain and ground water from paved streets, parking lots, sidewalks and roofs to natural bodies of water, to avoid street flooding.  
*Sanitary sewer* is a type of underground carriage system for transporting sewage from houses or industry to treatment or disposal.
4. The main method of sewage-treatment includes the following steps.
- Screening** : The sewage entering the sewage works is first 'screened'. That is, it is made to flow through a metal grid which removes the solids, like rags, plastics, wood and so forth.

- (ii) **Grit** : The sewage next flows slowly through long channels. As it flows, grit and sand in it settle down at the bottom and are removed from time to time from such channels.
  - (iii) **First settling tanks** : The liquid continues slowly through another series of tanks. Here about 40 per cent of the organic matter settles down as semi-liquid watery and slimy mire called *sludge*. The rest of the organic matter is in the form of tiny suspended particles which pass, with the liquid, to the aeration tanks.  
The sludge from the bottom of the tank is pumped to the sludge digestion plant.
  - (iv) **Aeration Tanks** : Oxygen is added to the sewage liquid, either by stirring it or by bubbling compressed air through it.  
In this way, the suspended solids and dissolved substance in sewage are removed, leaving fairly pure water.
  - (e) **Second settling tanks** : The micro-organisms settle out, forming a fine sludge which is returned to the aeration tanks to maintain their population. This is the ‘activated sludge’ and the whole process of water treatment has also been named as activated sludge process after it. The sewage stays in the aeration tanks for only 6–8 hours. When all the sludge has settled, the water is pure enough to be discharged into a river and the sludge passes to a digester.
5. The purpose of sludge digestion is to reduce the amount of organic matter and the number of disease causing micro-organisms present in the sludge.
  6. (i) **Aerobic composting** : In this type of composting, sludge is converted to compost or manure in the presence of air by the action of micro-organisms.
  - (ii) **Anaerobic composting** : The organic waste in Anaerobic composting is decomposed in the absence of air by the action of micro-organisms.
  - (iii) **Vermicomposting** : It refers to composting carried out by earthworms with the sludge. These worms eat the sludge passing it out as soil in their excreta or worm castings.

**B. Fill in the blanks :**

- |                       |           |             |
|-----------------------|-----------|-------------|
| 1. chemicals, disease | 2. Sewers | 3. Manholes |
| 4. hazard             | 5. Oxygen | 6. excreta  |

**C. Tick (✓) the correct option :**

- |        |        |        |        |
|--------|--------|--------|--------|
| 1. (c) | 2. (b) | 3. (a) | 4. (b) |
|--------|--------|--------|--------|