IX Water Security Answers

Unit 1 : Water Education

Chapter 1 Water Cycle

Written Assessment

(1) What is the water cycle?

Ans.

The continuous circulation of water on the earth, the convection of water from the oceans to the atmosphere, from the atmosphere to the land, and from land back to the oceans is called the water cycle.

(2) What are the main components of the water cycle?

Ans.

The sun, which primarily evaporates ocean water, is the major component of the water cycle, The other components of the water cycle include evaporation, transpiration, condensation, precipitation, and run-off.

(3) Write the names of different steps in the water cycle.

Ans.

The different steps in the water cycle are evaporation, liquefaction, and condensation.

(4) Describe the main processes in the water cycle.

Ans.

The main processes in water cycle are:

(i) Evaporation

It is the process by which water from sea, rivers, oceans, lakes, soil, and other water sources get converted into vapours due to the sun's heat.

(ii) Liquefaction

- As the vapour rises at higher altitudes, the air pressure and temperature decrease. This results in liquefaction of vapour.
- In this process, vapour is converted into tiny droplets of water.
- The tiny water droplets come together to form larger droplets. They transform into cloud.

(iii) Condensation

It is the process by which the vapour in air or atmosphere decreases and is converted back into water particles.

(5) Briefly describe the journey of rain.

Ans.

(i) The journey of rain involves evaporation of water, condensation into clouds, and precipitation back to the earth.
(ii) Clouds formed by the mixture of fine dust particles freeze due to the cold air in the upper atmosphere, forming water droplets.
(iii) When these clouds are blowing with the wind, they get blocked by mountains or high mountain ranges and move higher. The size of such clouds also increases.
(iv) At the same time, water droplets made up of tiny particles become larger and heavier in size and eventually fall back to the ground in the form of rain.
(v) This rainwater flows back down the hillside and takes the form of small streams, brook and then forms itself into a river or flows into the river. Sometimes it can accumulate in the form of lakes.

(6) Write about the different types of clouds.

Ans.

Cumulonimbus clouds

- Giant in size
- Water vapour freezes, large amount of energy is generated which accumulates in these clouds.
- Causes thunder and lightning
- Occasional major storm or hurricane.

Nimbostratus clouds

- Also known as crazy black curved or grey black cloud.
- It is a very large type of cloud.
- Can cause heavy rainfall at any time.
- Can also cause snowfall.

Oral Assessment

(1) What are the factors that affect seepage and run-off?

Ans.

The factors that affect seepage are:

(i) Soil porosity (ii) Soil type
(iii) Slope of the groundwater

The factors that affect run-off are:

(i) Rainfall intensity (ii) Soil texture
(iii) Watershed size – length, width

(2) State the types of rainfall.

Ans.

The types of rainfall are:

(i) Ascending (converging) rainfall (ii) Resistance rainfall (iii) Periodic rainfall

(3) What is monsoon?

Ans.

Rainfall in the Indian subcontinent is called 'Monsoon'. Monsoon is a slang of the Arabic word '*Mausam*'. It means season.

(4) What is condensation nuclei?

Ans.

(i) The fine dust particles in the air begin to accumulate around water vapour molecules to form condensation nuclei.
(ii) Many condensation nuclei combine to form vapours that form droplets, and ultimately give rise to clouds.

(5) Name the two types of clouds in the sky.

Ans.

The two types of clouds in the sky are Cumulonimbus and Nimbostratus clouds.

Activities

[Students are expected to perform these activities on their own.]

Chapter 2 River System

Written Assessment

(1) What are the uses of river?

Ans.

The uses of river are:

Source of life

- Rivers are the main source of water for living beings.
- Humans use river water for drinking, industries, power generation, transportation, and running
- large machines.
- Rivers have been used for obtaining food since olden times.
- River water is also used for agriculture, fishing, and food production.

Transportation

- In today's world, transportation is being carried on the largest and most important rivers in the world.
- Rivers are also used to transport cut wood in the forest areas.

Recreation and tourism

- Rivers attract more tourists and provide opportunities for the local community to service cruises.
- Waterfalls can become the centre of travel.
- Kayaking, a fast sailing boat is used in rushing waters.

Religious and social activities

- Several festivals are organized along the river's banks to express gratitude for the river.
- Daily activities such as bathing, prayers, chanting, tarpan, etc., began on the banks of the rivers since ancient times.

(2) Identify the factors that harm the rivers.

Ans.

The factors that harm the rivers are:

(i) Dumping of industrial and domestic waste pollutes river water and makes it unfit for consumption.
(ii) Deforestation and soil erosion also degrade riverbanks and reduce water quality.
(iii) Also, overuse of river water for agriculture and urban needs leads to reduced flow and affects aquatic life and ecosystems.

(3) If you find any type of river pollution, what will you do?

Ans.

If I find any type of river pollution, I will first avoid contributing to it and spread awareness among others about keeping rivers clean. I will report the pollution to local authorities or environmental agencies so they can take proper action. I will also participate in or support river cleaning drives and encourage the use of eco-friendly practices. Protecting rivers is our responsibility for ensuring clean water and a healthy environment for all.

(4) What are the main types of rivers?

Ans.

The main types of rivers are:

(i) Noisy river (ii) Old river (iii) Revived river (iv) Living river
(v) Slow river

(5) What landforms are formed by rivers?

Ans.

The landforms formed by rivers are V-shaped valleys (ghalai), furrow or trenches (ghals), waterfalls, Pot-holes (ranjan khalge).

(6) Explain the difference between a living river and a dead river.

(i) A river that flows into a river basin in the form of springs even in the absence of rain is called a living river.
(ii) A river that stops flowing when the rains stop is called a dead river.

Oral Assessment

(1) Which main river flows through your taluka? What is the type of this river? What will be the average length, width, depth of its basin?
(2) What landforms are created by the river in your area?
(3) How many tributaries or springs-brooklets-rivulets meet that river?
(4) Which river flows next to that river? OR This river meets which major river?
(5) What are the major check dams, lakes, dams on the river?

[The answers to these questions will vary from student to student. They are expected to answer these questions on their own.]

Activities

[Students are expected to perform these activities on their own.]

Chapter 3 Watershed Area and Water Types

Written Assessment

(1) Write the classification of watershed areas/catchment areas.

Ans.

Classification of watershed areas / catchment areas by area

(i) Micro watershed (up to 10 hectares)
(ii) Mini watershed (up to 200 hectares)
(iii) Sub watershed (up to 4000 hectares)
(iv) River valley (No area limit)

(2) Write any four properties of the watershed area/catchment area.

Ans.

The properties of watershed area/catchment area are:

(i) Dimensions

(a)The total watershed area to be maintained in the catchment area is determined by the dimensions of the catchment area.
(b) A big catchment area is also advantageous for drainage.
(c) However, as the catchment area grows larger, so does the variation in geological composition, soil type, slope, and so on.

(ii) Size

(a) The size of the catchment region influences the source that flows through it.

(b) The proportion of the catchment area's watershed is proportional to the ratio of its length and width; it is inversely proportional to the length and directly proportional to the width.

(iii) Slope

(a) The height of the highest point in the catchment area and the greatest length of the slope define the average slope of a watershed.
(b) The watershed at the source of the steep slope catchment region is always greater than the watershed in the same area's flat catchment.

(iv) Ground cover

(a) It is the surface vegetation, which affects both the surface watershed and the soil erosion.
(b) If there is dense vegetation on the ground, soil erosion is reduced and vice versa.
(c) Also the roots of the plants increase the porosity of the soil, causing more water to seep into the soil. This reduces the catchment area.

(3) Briefly explain any two properties of rain.

Ans.

(i) Amount of rainfall

(a) Rainfall is the rainwater that falls on the surface. It is measured in millimetres.
(b) The measure of the total rainfall throughout the year is considered to be the average annual rainfall of the area.
(c) This determines the total watershed of a catchment area.

(ii) Rainfall density

(a) It is the amount of rain that falls over a period of time. It is measured in millimetres per hour.
(b) The total rainfall in a given hour is the density of rainfall in that hour.
(c) Rainfall density is determined by automatic drawing type rain gauges.
(d) The hour in which the maximum rainfall density is found throughout the year is considered to be the maximum rainfall density of that catchment area for that particular year.

(4) Write the names of various groundwater sources.

Ans.

The various groundwater sources are rainfall, connate water, and magma (volcanic) water.

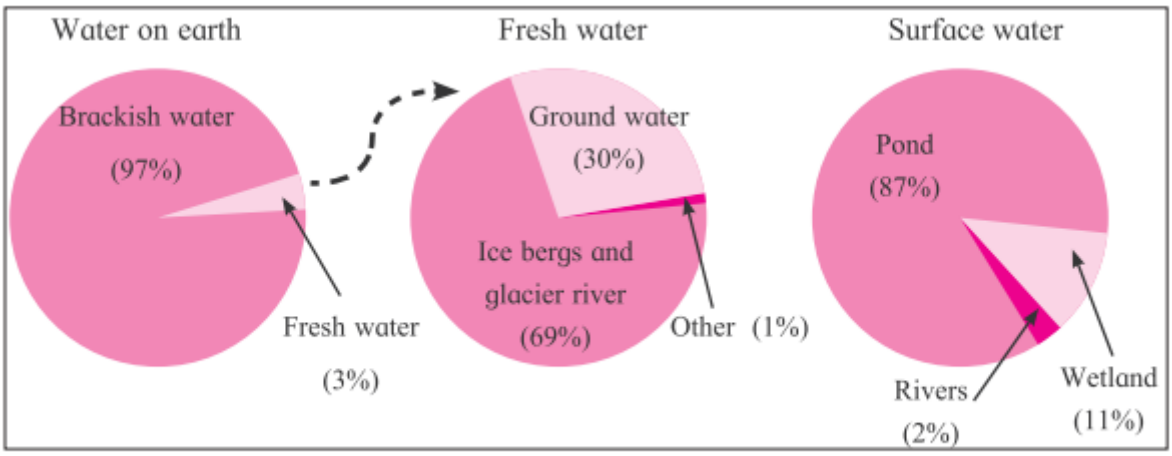
(5) Write how magma water is formed.

Ans.

When water vapour in molten rocks is formed due to underground magma, it tries to rise through the available notches. If there is no place to rise, it eventually condenses and transforms into the water. This is how magma or volcanic water.

(6) Explain the distribution of water on the earth with the help of diagram.

Ans.



Distribution of water

- Most of the water on the earth is brackish water (97%) present in the oceans.
- Majority of the fresh water is in the form of ice and snow, while the rest is found in lakes, rivers, groundwater, and air vapour.
- Out of the total amount of water available on the earth which is high, less than 1% of it is available as usable water.

(7) Write the characteristics of unsaturated aquifers.

Ans.

- It is located above the saturated aquifer.
- The soil and rock pores in this area contain air as well as water.
- Being close to the surface, it is affected by atmospheric pressure.
- This part does not exist where there is a lake and swamp.
- In the desert region it covers hundreds of meters.
- It controls the flow of water from the surface to the saturated aquifer. This affects the recharge of the aquifer.

(8) Explain the types of surface water by stating what it means.

Ans.

Surface water is of three types.

(i) Perennial: Water is present all the year round. If rainfall is low, it is recharged by groundwater.
(ii) Temporary: It contains water only for a few months of the year. These include small creeks, coastal creeks.
(iii) Man-made: This is artificially stored water, including water from dams, and constructed catchment areas.

(9) Write the classification of groundwater according to geographical location.

Ans.

On the basis of geographical formation, groundwater is classified as follows:

Aquifer

- It is made up of soil, sandy soil, muddy, cracked rock, limestone etc.
- Aquifers have hollow spaces that can be connected to each other, through which water can seep.
- Depending on their location in the ground, aquifers are classified in two types - Unconfined aquifer and Confined aquifer.

Aquitard

- This layer has low permeability, hence water is not readily available.
- If a reservoir is located below this layer, water seeps into the reservoir.

Aquiclude

- This layer being porous has good water holding capacity.
- It does not seep water, hence water is not available from this.

Aquifuge

- It is impermeable and not porous.
- Cannot hold water.
- Water does not seep through it.

Hanging aquifer

- Located on top of the unsaturated aquifer.
- Generally, it is small in size.
- The amount of water in a hanging aquifer depends on the weather conditions.

Oral Assessment

(1) What are the two main components of the earth's surface?

Ans.

The two main components of the earth's surface are continents and ocean basins.

(2) What differences can you see among the terrane layers in the picture on Page No. 17 of the textbook?

Ans.

In the picture of terrane layers, differences can be seen in the vegetation cover. A difference in the water levels can also be seen.

(3) What happens if there is a huge pressure on the saturated water table?

Ans.

A huge pressure on the saturated water table can result in a rise in pore water pressure and a decrease in effective stress within the soil. This can cause the soil to become less stable and more prone to subsidence (sinking) or landslides, especially in areas with weak or unconsolidated soil.

(4) What happens if water is pumped out of the well from different water holding layers?

Ans.

Pumping water from different layers of a well can results in the following effects:

- Lowering of the water table
- Potential land subsidence
- Changes in water quality

(5) How many types of water resources are there on the earth?

Ans.

There are three main types of water resources on the earth. These are surface water, groundwater, and salt water.

Activities

[Students are expected to perform these activities on their own.]

Chapter 4 Soil and Rock Type

Written Assessment

(1) How is black basalt formed?

Ans.

(i) Black basalt, found in Maharashtra, developed billions of years ago, when lava erupted and cooled on the ground.
(ii) The solidification of molten lava (magma) gave rise of black basalt.
(iii) In certain locations, the deposition of ash from lava eruptions creates a coating of grey-white ash.

(2) What are the main components of black basalt?

Ans.

The main components of black basalt are:

- Iron silicates
- Magnesium silicates
- Pyroxene
- Olivine
- Calcic plagioclase

(3) Explain the main process of erosion.

Ans.

(i) The process by which rocks are transformed into soil is called weathering of rock.
(ii) Due to the constant changes in air, water, temperature and pressure, rocks and boulders break up, erode and eventually turn into fine particles and become soil.

(4) State the types of soil particles.

Ans.

The soil particles vary in size. According to their size, they are of the following types:

(i) Clay – Smaller than 0.0002 mm
(ii) Silt – 2.022 mm – 0.05 mm
(iii) Sand – 0.5 mm – 2 mm
(iv) Stone - >2 mm

(5) How does soil help in land fertility?

Ans.

(i) Soil contains various types of micro-organisms.
(ii) These microbes cause the decomposition of remains of plants and animals mixed in the soil.
(iii) Decomposition results in the production of nitrogenous compounds which increases land fertility.
(iv) The soil formed due to decomposition of plant and animal remains is called humus.
(v) Soil supports plant growth by providing various nutrients and minerals.

Oral Assessment

(1) What type of rock is there in your taluka-district?

Ans.

[Students are expected to answer this question on their own.]

(2) What is soil made up of?

Ans.

Soil is made up of rocks, gravel, sand, fine clay, and organic matter.

(3) What is impermeable rock?

An impermeable rock is one that does not allow (or allows a negligible) amount of fluids (gas and liquid) to pass through it.

Activities

[Students are expected to perform these activities on their own.]

Unit 2: Water Education

Chapter 1 Water Cycle

Written Assessment

(1) What is a well? What are the different types of wells?

Ans.

The construction of a pit to draw water from the ground is called a well. The different types of wells are Aad, narrow and deep well, round well, square well, elongated well, tube well, pushkarani (pond), barav, budki, bore well, and ring well.

(2) What is a Bodi?

Ans.

A Bodi is a small lake constructed in the districts of Vidarbha which are used to feed water to the paddy fields.

(3) Where should a farm pond be built?

Ans.

(i) A farm pond should be built on the barren land with low permeability, on the sloppy banks of the stream.
(ii) They should be built on the upper side of the farm, where there is water shortage and water needs to be made available for the crops.

(4) What are the uses of the pond/lake?

Ans.

The uses of pond/lake are:

(i) Water supply to the village
(ii) Religious activities
(iii) Decoration of the temple
(iv) Temple beautification
(v) Providing facilities for travellers
(vi) Modern urban planning
(vii) Storage of rainwater
(viii) Fish farming
(ix) Improvement of salty lands and wetlands
(x) Protective irrigation to crops

Oral Assessment

(1) What is a Budki?

Ans.

Budki is a well that is constructed along a river or stream and has water only in the rainy season.

(2) Where is a bore well drilled?

Ans. A bore well is drilled where groundwater level is deep.

(3) What is the objective of renewal of old Bodis?

Ans.

The objective of renewal of old Bodis is to recharge them by interrupting the running water and to provide protective irrigation to rice crops in case of emergency.

Chapter 2 Concept of Water Conservation

Written Assessment

(1) What is water conservation?

Ans.

Water conservation refers to the use of man-made measures to block, store, and intake the rainwater in an area by constructing various structures and allowing it to be used for drinking, consumption, industry, and agriculture until the next monsoon.

(2) Explain the division of rainwater.

Ans.

- The season cycle of summer, monsoon, and winter exists in nature.
- Not all parts of Maharashtra receive uniform rainfall.
- Water that falls during the rainy season naturally seeps into the soil.
- Some water is stored as surface water.
- Some water evaporates, some of it is directly used by plants, and rest is carried away in the form of run-off.
- A run-off is a water stream flowing over the surface.
- Water sources found in hills, river basins, and wells in the form of springs begin depleting within a few days after the end of the monsoon.

(3) Why do you think water conservation is needed?

Ans.

(i) Water conservation is crucial because freshwater is a finite and essential resource.
(ii) With increasing population, urbanization, and climate change, the demand for water is rising.
(iii) Water is still available as it used to be earlier. However, water consumption is increased due to population growth.
(iv) The amount of water available from water conservation is reducing drastically.
(v) Keeping in mind all of this, water conservation is necessary to ensure its availability for future generations, protect ecosystems, and support economic activities.

(4) In which type of soil, water conservation is done? What care needs to be taken?

Ans.

(i) Water conservation is primarily done in sandy and loamy soils.
(ii) Sandy soils have larger particles and good drainage, which can lead to quick water loss, while loamy soils retain moisture well and are ideal for agriculture.
(iii) To conserve water in these soils, it is important to implement practices such as mulching, using cover crops, and maintaining soil structure to enhance water retention.

(5) Explain the usefulness of water conservation.

Ans.

Water conservation can help accomplish the following goals in terms of economic development of the state's rural areas based on public involvement and natural resources:

(i) Sustainability

Water retention will occur accidentally if the abstraction/lifting of water from the catchment region is less than the recharge rate, as well as a reduction in per capita water use, and a sustainable water supply may be assured.

(ii) Energy conservation

Nearly 15% of the electricity is used for energy conservation. Reducing water consumption will save energy and help to conserve it.

(iii) Habitat conservation

Reducing the use of fresh water will keep freshwater reservoirs intact and protect the living organisms.

(6) What are the functions of Maharashtra Water Conservation Department?

Ans.

The functions of Maharashtra Water Conservation Department are:

(i) Minimum land acquisition process
(ii) Implementation of small and medium
(iii) Scale irrigation projects at low cost in 1 to 2 years
(iv) Raising of ground water level
(v) Siltation for large and medium projects
(vi) Prevention of soil erosion
(vii) Creation of decentralized water reservoirs

(7) Why are there limitations in rainwater harvesting in urban areas? How can water conservation be done through public participation?

Ans.

(i) Concreting of most part of the urban areas prevents water from naturally infiltrating the soil, thus reducing its potential for groundwater recharge.
(ii) In the past, there was soil in the premises of the buildings. There are lot of grounds and open spaces are available. So the water would first seep into the ground and then come out of the yard. Hence, the water came slowly and it took time to fill the runnels.
(iii) Now, due to depletion or disappearance of soil, the water immediately and completely enters the runnels and creates flood-like conditions in the area.
(v) Public participation in water conservation can be achieved through education, community involvement, incentives, competitions, and policy advocacy.

(8) Mention the advantages of rainwater harvesting.

Ans.

The advantages of rainwater harvesting are:

(i) Strengthening of existing water resources.
(ii) Improvement of water quality.
(iii) Prolonging the life of a well or borewell.
(iv) Waterlogging and flooding can be prevented.
(v) Reduction of salts in borewell water to make it drinkable.
(vi) Continuation of the journey towards self-sufficiency.
(vii) No complete dependency on government for water.

Oral Assessment

(1) Where is the headquarters of Maharashtra State Water Conservation Corporation located?

Ans.

The headquarters of Maharashtra State Water Conservation Corporation is located at Aurangabad.

(2) What is rainwater harvesting?

Ans.

Rainwater harvesting is the process of diverting, infiltrating, and making rainwater available in the same area, in the right place, in the right way, for use at a later stage.

(3) What is a run-off?

Ans.

A run-off is a water stream flowing over the surface.

Activities

[Students are expected to perform these activities on their own.]

Chapter 3 Catchment / Watershed Treatment

Written Assessment

(1) Explain the care to be taken while deepening the streams.

Ans.

The following care should be taken while deepening the streams:

(i) Streams should not be deepened where there is land storage in the stream basin.
(ii) The works should be implemented as a priority in highly absorbed areas and absorbed catchment areas.

(iii) It is not advisable to undertake the work of deepening the streams in the alluvial region as the soil region is impermeable due to clay.

(2) State the main benefits of catchment/watershed treatment.

Ans.

The main benefits of catchment/watershed treatment are:

(i) Improvement in water quality and availability
(ii) Minimizing soil erosion
(iii) Mitigating floods and droughts
(iv) Replenishes the groundwater
(v) Protected irrigation for plant growth

(3) What should be done to prevent check dams from collapsing?

Ans.

The following should be done to prevent check dams from collapsing:

(i) When deciding the nature of work and prior to sludge removal, the surrounding slopes, geographical conditions, speed of water flow, etc., need to be considered.
(ii) At least two Gabion dams should be built at the top of the stream.
(iii) While removing sludge, maintain the natural slope of the source. It should not be changed.
(iv) A 45 degrees slope on both sides should be kept. It brings stability and prevents the side from collapsing.

(4) List the catchment/watershed treatments in your area.

Ans. *[Students are expected to answer this question on their own.]*

(5) Explain the statement: "Farm ponds with plastic bottoms cannot be part of water recharge."

Ans.

Farm ponds with plastic bottoms cannot contribute to groundwater recharge because the plastic liner prevents water from percolating into the ground. Water recharge relies on the natural process of water seeping into the soil and replenishing underground aquifers. A plastic liner acts as a barrier, preventing this natural infiltration and thus hindering water recharge.

(6) Explain the construction of deep continuous contour trenches.

Ans.

Construction of deep continuous contour trenches:

(i) 240 m long, 1 m wide, and 1 m deep trenches should be dug per hectare.
(ii) The vertical distance between the two trenches should be 33 m.
(iii) After every 20 m long trench, a gap of 2 m is to be left to remove excess water and then another long trench of 20 m is dug.
(iv) While digging the second row, the first trench must be 10 m long.
(v) Leave a 2 m gap. At the same level, dig another trench of 20 m length.
(vi) Sow 4.80 kg of grass seeds per hectare at full length of trenches.

(7) Write the significance of construction of concrete cement stream check dams.

Ans.

(i) The construction of concrete cement stream check dams allows infiltration of rainwater on the spot.
(ii) It helps prevent leakage of water.
(iii) The use of cement increases the quality and lifespan of the dam.

Oral Assessment

(1) Which of the following check dams would be suitable for water conservation, a rough stone dam and a gabion dam in a rain-fed catchment area?

Ans.

In a rain-fed catchment area, a gabion dam would be more suitable for water conservation compared to a rough stone dam due to their ability to withstand high water flows and adapt to changing terrain, making them more effective in areas with heavy rainfall and potentially steep slopes.

(2) Does soil erosion hinder water conservation work? Explain your point.

Ans.

Yes, soil erosion significantly hinders water conservation efforts. It reduces the soil's capacity to absorb and retain water, resulting in increased run-off, which can cause flooding and erosion in other areas.

(3) Which treatment in the catchment/watershed area has made it possible to cultivate in the hills?

Ans.

Bunds, also known as terracing, are the primary treatment in catchment/watershed areas that enables cultivation on hills.

(4) Would water conservation works be useful on a flat surface with abundant rainfall?

Ans.

Yes, water conservation works can be useful even on a flat surface with abundant rainfall. While the area may not experience water scarcity, conserving water can still offer benefits such as reducing soil erosion, preventing flooding, and improving water quality.

Activities

[Students are expected to perform these activities on their own.]

Chapter 4 Water Recharge

Written Assessment

(1) What are the methods of water conservation?

Ans.

The various methods of water conservation are:

(i) Groundwater recharge
(ii) Rainwater harvesting
(iii) Watershed management
(iv) Smart irrigation systems
(v) Greywater recycling

(2) Explain the need of water recharge in brief.

Ans.

(i) Water recharge is crucial for replenishing groundwater supplies, which are essential for drinking water, agriculture, and ecosystems.
(ii) It involves replenishing aquifers, which are underground layers of rock and soil that hold water, by allowing surface water to percolate down.
(iii) This helps address issues like aquifer depletion, land subsidence, and saltwater intrusion, ensuring a sustainable water future.

(3) Explain the importance of suction pits in the process of water recharge.

Ans.

(i) The suction pit is an important part of the rainwater filtration system.
(ii) For recharge of water in sources such as borewell or well, the suction pit acts as a filter.
(iii) They facilitate the infiltration of rainwater into the ground, replenishing aquifers and increasing the groundwater levels.
(iv) By acting as filters, suction pits allow water to percolate slowly and naturally into the soil.

(4) What care should be taken while recharging a well or borewell?

Ans.

While recharging a well or borewell, the following care should be taken:

(i) Water coming to the stream should be free from salts and chemicals.
(ii) Water should be piped to the bottom of the well.
(iii) Before refilling, there need to be two filter pits.
(iv) The sludge from the well should be removed before refilling.
(v) Recharge should be done with filtered and clean water only.
(vi) Water on the area where salt has spilled, i.e., salts have accumulated, should not be used to recharge wells.
(vii) Sand and gravel used to form the filter need to be cleaned once prior to the rainy season.

(5) Explain with reason the most useful method of water filtration in your area.

Ans.

[Students are expected to answer this question on their own.]

(6) What care should be taken while recharging groundwater?

Ans.

The following care should be taken while recharging groundwater:

(i) When recharging groundwater or using rainwater for it, appropriate care needs to be taken.
(ii) When infiltrating water in any place, it is essential to filter the rainwater through a proper infiltration system.
(iii) After the onset of rains, the first one or two rainwater recharges should be avoided as the rainwater may be acidic or sometimes unclean.
(iv) When borewells are drilled, each one of them must be refilled. Otherwise, they will dry out suddenly at any time.
(v) Measures need to be taken according to the location under the guidance of the right expert and experienced person.
(vi) This will ensure year-round source of water and groundwater.

Oral Assessment

(1) What is groundwater recharge?

Ans.

Groundwater recharge refers to the process of infiltration of rainwater into the soil in different ways to increase groundwater storage.

(2) In which state was the 'Devas filter' first constructed?

Ans.

The 'Devas filter' was first constructed in Madhya Pradesh.

(3) What is the reason why borewells and wells are without water?

Ans.

The reason why borewells and wells are without water is the lowered water level in the soil.

Unit 3: Water Management

Chapter 1 Water is The Basis of Life

Written Assessment

(1) Explain the relationship between water and living organisms.

Ans.

(i) All living organisms on earth are made up of water.
(ii) Water is the source of life for plants and animals.
(iii) It is fundamental for the survival and functioning of all living organisms.
(iv) It serves as a universal solvent, crucial for sustaining life.

(2) How is water scarcity intensity divided according to Falcon criteria?

Ans.

(i) According to Falcon standards, a region is said to be in good water condition if it has more than 1700 cubic metres of water available per capita per year.
(ii) If the yearly per capita availability of water is less than 1000 cubic metres, water scarcity has a negative impact on people's living standards.

(3) Give an example of unequal availability of water for use despite the same rainfall.

Ans.

A common example of unequal water availability despite similar rainfall is a situation where two neighbouring regions receive nearly the same amount of rain, but one area has a high water table due to permeable soil, allowing for easy access to groundwater through wells, while the other has a low water table with impermeable rock, making it difficult to access groundwater even with the same rainfall, leading to water scarcity in the latter region.

(4) Why is groundwater depleted?

Ans.

(i) In our country, farmers traditionally draw water from wells to irrigate their crops and irrigate the entire farmland.
(ii) So water is wasted and excessive use of water decreases groundwater level.
(iii) Tube wells more than 400-500 feet deep are being dug and water is being pumped out of the ground.
(iv) In our country, 65% of the water used for irrigation and 3% of the water used for domestic use is drawn from wells.
(v) Groundwater reserves are rapidly declining due to the depletion of such abundant water for irrigation.

(5) What is the relationship between river health and urbanisation?

Ans.

(i) Urbanisation has resulted in several cities, industrial projects, and factories are located on the banks of big rivers.
(ii) This has resulted in the pollution of river water.
(iii) The health of rivers has deteriorated due to sewage and waste discharged from industries and factories.
(iv) Urbanisation has significantly impacted river health, generally leading to deterioration through increased pollution and habitat destruction.
(v) Urban development results in the discharge of pollutants, change in river flow patterns, and the loss of natural vegetation, all of which negatively affect water quality and aquatic ecosystems.
(vi) Some rivers have stopped flowing because of extreme groundwater abstraction.

Oral Assessment

(1) Where do farmers traditionally draw water from to irrigate their crops?

Ans.

Farmers traditionally draw water from wells to irrigate their crops and irrigate the entire farmland.

(2) Name some ancient cultures that were formed on the banks of rivers.

Ans.

The ancient cultures of Mesopotamia, Egypt, and Harappa were formed on the banks of rivers.

(3) Why has the health of rivers deteriorated?

Ans.

The health of rivers deteriorated due to sewage and waste from the factories.

Activity

[Students are expected to perform this activity on their own.]

Chapter 2 Our Water Consumption

Written Assessment

(1) State the total types of water consumption.

Ans.

Water consumption can be categorised into various types:

Domestic

This includes water used for bathing, cooking, cleaning, drinking, and other household activities.

Agricultural

Water used for irrigation systems to support crop production.

Industrial

Water is widely used for various agro-based and non-agricultural industries in manufacturing processes, power generation, and other industrial operations.

Public uses

Water is used for public amenities such as firefighting, road cleaning, park cleaning, etc.

(2) How do we use water for domestic purposes?

Ans.

Domestic water use encompasses all the ways water is utilised within a household, both indoors and outdoors.

(i) Indoor uses

Drinking and cooking

Water forms an important part of our diet, both for direct consumption and preparation of food.

Cleaning

All tasks such as washing dishes and cleaning the house depend on water.

Toilet flushing

A major portion of indoor water use is meant for toilet flushing.

Other household uses

Water is also used for various other household purposes such as washing machines, dish washers, etc.

(ii) Outdoor uses

Gardening and landscaping

Watering gardens, lawns, and other plants is a common outdoor use of plants.

Car washing

Washing car is another common outdoor use of water.

(3) How water is used for agriculture?

Ans.

(i) Water plays a key role in agriculture, primarily for irrigation to supply crops with the required amount needed for proper growth.
(ii) Crops are irrigated using the irrigation system.
(iii) Water is used for various agro-based industries such as fruit processing, sugar factories, etc.

(iv) In addition to irrigation, water is also used for application of fertilizers and pesticides, and sustaining livestock.

(4) Which area needs maximum water?

Ans.

(i) The area that needs maximum water is one where agriculture and farming happens, especially for water-intensive crops such as rice and sugarcane. These crops have high water requirement during their growth cycle.
(ii) Besides agriculture, water is widely used for agro-based industries such as sugar factories, fruit processing, and non-agricultural industries such as roads, factories, dams, colonies, etc.

(5) Explain the relationship between environmental protection and water.

Ans.

(i) All living organisms, including plants and animals need water to drink.
(ii) Water impacts soil and rock formations.
(iii) Life cannot exist without water.
(iv) Water alone maintains the balance of all organic-inorganic elements in nature.
(v) Water helps protect food chains in nature including plants, animals, insects, and birds.
(vi) Environmental protection and water are naturally linked.
(vii) Water is essential for all life and ecosystems, while its quality and availability is directly linked to the environmental conditions.

(6) State the commercial uses of water.

Ans.

Water has numerous commercial uses. These include:

(i) Agriculture and irrigation

Crops are irrigated using the irrigation system, ensuring their growth and yield.

(ii) Livestock

Water is also used for drinking and sanitation of livestock.

(iii) Industries

Water is used for specific process in various agro-based industries such as sugar factories and food processing. It is also used in non-agricultural industries such as dams, roads, colonies, various factories, etc.

(iv) Power generation

Water from the dam is used for hydroelectric power generation.

(v) Fishing and fisheries

Fishing is extensively practiced in lakes, seas, dams, rivers, creeks, and various reservoirs. Fish farming is practiced in farm puddles, lakes, small ponds, and ponds.

(vi) Shipping

Shipping is one of the cheapest options available for transportation.

(vii) Tourism

Plenty of water is used in various tourist places for facilities such as swimming pools, attractive gardens, accommodation, etc.

Oral Assessment

(1) Who is the center point for the factor of water in rural areas?

Ans.

The farmer is the center point for the factor of water in rural areas.

(2) For which agro-based industries is water widely used?

Ans.

Water is widely used for various agro-based industries such as fruit processing and sugar factories.

(3) Name the places in Maharashtra where hydroelectric power generation projects are located.

Ans.

The places in Maharashtra where hydroelectric power generation projects are located are Koyna, Bhivpuri, Bhira, Pophali, Warna, Khopoli, Vaitarna, etc.

Activities

[Students are expected to perform the given activities on their own.]

Chapter 3 The Journey of Water: Dam to House

Written Assessment

(1) Describe the stages of water flow from the dam to the house.

Ans.

Water flows from the dam to the house in a multi-stage process.

(i) Reservoir storage

Dams create reservoirs to store large volumes of water. According to the requirement, water is released.

(ii) Water intake

Water is initially brought to the water treatment plant using energy or slope. This is done through pipes or canals.

(iii) Water treatment

- Filtration: Large debris and particles are removed through screens and sedimentation processes.
- Disinfection: The water is disinfected using chlorine, ultraviolet light, or other methods to kill harmful bacteria and viruses.
- Further Filtration: Additional filtration steps remove smaller particles and impurities.
- Testing: The treated water is tested to ensure it meets the required safety standards
- Storage: Purified water is stored in storage tanks constructed at high altitudes.

(iv) Distribution

Water is distributed from the storage tanks to houses through a network of pipes.

(v) Supply of water

Water is supplied to every house through the main aqueduct, sub-aqueduct, and through the plumbing to the taps.

(2) What is water purification?

Ans.

Water purification is the process of removing undesirable substances, chemicals, microbes, salts, contaminants, suspended solids, etc., from water so that it is fit for the specific purpose for which it is going to be used. Water purification is carried out to make water clean, healthy, drinkable, and usable.

(3) Briefly describe the process of water purification.

Ans.

(i) The water to be treated is churned at the water treatment plant after mixing the chemicals.
(ii) Water is filtered after the sludge settles down.
(iii) Aeration is done to remove the following:
Unwanted gases like H_2S, CO_2, etc.
Substances that give water a foul and unpleasant taste
Water volatile substances. e.g. chloroform
Reduced compounds of iron and manganese.
(iv) Aeration is also used to increase the amount of dissolved oxygen in groundwater.
(v) Removal of carbon dioxide in water minimises the amount of metal corrosion in contact with water.
(vi) It is then purified using disinfectants.
(vii) The quality of purified water is checked with various tests.

(4) How does the water purification project maintenance system work?

Ans.

(i) The Government oversees water delivery until building completion, then hands over responsibility to the gram panchayat, municipality, or corporation.
(ii) Managing city water is harder than in villages due to complex systems and higher demand.
(iii) Maintenance includes fixing leaks, faucets, and ensuring proper pressure throughout.
(iv) Daily checks are vital—from source to sedimentation tanks to final drinking points.
(v) Chemical levels, like chlorine and coagulants, must be accurate and well-stocked.
(vi) Shortages can risk public health, making inventory checks essential.
(vii) Backup pumps or machines must be ready in case of failures or repairs.
(viii) A lab near the purification site supports testing.

(5) What does maintenance management include?

Ans.

Maintenance management includes:

(i) Maintenance of various machines and instruments used. E.g. repairing a broken faucet or pipeline, delivering water with the right amount of pressure everywhere.
(ii) Examining the water coming from the source, water coming out of the sedimentation tanks and filters, and water available for direct drinking at all such stages.
(iii) Ensuring that chemical treatment of water is properly being carried out and whether there is sufficient stock of chlorine and coagulants.
(iv) Ensuring that at least one standby machine pump is available.
(v) Presence of a laboratory near the water purification centre in the city.
(vi) Experimenting with new types of discoveries or doing some new basic research.

(6) What factors need to be considered while choosing a site for constructing a water lifting station?

Ans.

While choosing a site for constructing a water lifting station, the following factors need to be considered:

(i) Properties of water should not be affected.
(ii) Water distribution should be simplified.
(iii) Availability of electricity or similar energy.
(iv) Safety from crisis such as flood, fire, etc.

Oral Assessment

(1) What are canals?

Ans.

A canal is a channel constructed to carry water or to supply water from dam to the desired location.

(2) What are sub-canals?

Ans.

A sub-canal is a canal built to carry water or supply water to a farm by connecting it to the main canal.

(3) How much percentage of the earth's surface is covered with water?

Ans.

Nearly 71 percent of the earth's surface is covered with water.

(4) What is a water treatment plant?

Ans.

The place where various processes are carried out to make the water that is stored in the dam drinkable is called a water treatment plant.

(5) How do cities that are close to the seashore supply water in case of a water shortage?

Ans.

In case of a water shortage, cities that are close to the seashore (e.g. Mumbai, Chennai, Kolkata, etc.) supply water by distilling seawater.

Activity

[Students are expected to perform the given activity on their own.]

Chapter 4 What is Water Management?

Written Assessment

(1) What is management? Explain with an example.

Ans.

(i) Management is the process that involves the planned use of convenience, human, and material resources, etc., to complete the task and action.
(ii) While running a family, tasks need to be shared according to the needs, income, arrangements and strengths of each member.
(iii) Now, just as it is possible for a big or small family, to live in an environment where the needs and incomes are more or less dependent on the environment, it is necessary to make arrangements accordingly.
(iv) The key to ensuring a happy family life is the habit of keeping the needs to a minimum, a disciplined effort for a sufficient income, adequate education to carry out one's role properly and then honest work on it.
(v) With proper management, inward and outward accounts can be maintained.

(2) Explain the need for water management.

Ans.

(i) Human beings have been using water for drinking and fulfilling various needs since pre-historic times.
(ii) Man started using water for agriculture after its discovery.
(iii) After the industrial revolution, the use of water for industry and other ancillary businesses increased.
(iv) Storage of water in small and big dams has been adopted. This has resulted in availability of some amount of water.
(v) However, due to the rising demand for human development in the modern era, there is a great pressure on natural resources. This has resulted in the depletion of natural resources.
(vi) The condition of water supply in the world as a whole is becoming more and more precarious.
(vii) Water problem is one of the biggest problems that the world is facing. However, the seriousness of this issue is overlooked by many around the world.
(viii) Water management refers to the policy of allocating water on the principle of equal justice for all, taking into account problems in all three areas – drinking water, water for industry, and water for agriculture.

(3) What are the problems encountered in water management?

Ans.

(i) Water management faces several problems such as uneven distribution of water, leading to shortages in some areas and excess in others.
(ii) Leakage in pipelines and poor maintenance of infrastructure cause significant water loss.
(iii) Pollution of water sources due to industrial waste, sewage, and chemicals affects water quality.
(iv) Overuse of groundwater and lack of rainwater harvesting results in depletion of natural resources.
(v) Additionally, lack of public awareness and coordination among departments interferes with effective water management.

(4) What are the important activities for water management?

Ans.

The important activities for water management include:

(i) Carrying out water conservation works in different parts of the state so that every drop of rainwater can be utilised.
(ii) Groundwater recharge boosts groundwater level and allows proper use of water.
(iii) Stopping water pollution by not allowing people to immersing things in water bodies. Proper treatment of substances from industries and factories before being discharged in water.
(iv) Economic use of water in agriculture using drip irrigation, sprinkler irrigation, and micro irrigation.
(v) Improving public participation and awareness to encourage responsible water usage.
(vi) Installation of water meters in urban areas.

(5) How to save water in rural and urban areas?

Ans.

Ways to save water in rural and urban areas:

In Rural Areas:

- Practice rainwater harvesting to collect and store rainwater for farming and household use.
- Use drip irrigation or sprinkler systems to reduce water wastage in agriculture.
- Repair leaky hand-pumps, taps, and pipelines promptly.

In Urban Areas:

- Fix leaking taps, toilets, and pipelines in homes and buildings.
- Install water-saving devices like low-flow taps and dual-flush toilets.
- Avoid wasting water while washing cars, dishes, or bathing.

(6) List the ways in which we can save water in the home and the society.

Ans.

The different ways in which water can be saved in the home and the society are:

(i) Water saving needs to be done at a domestic level collectively as well as at an individual level.
(ii) Taking only a small amount of drinking water in a glass as per the requirement.
(iii) Watering the gardens, fields, or plants before sunrise and after sunset to reduce evaporation.
(iv) Using sewage water for garden plants.

(v) Take water in a bucket while washing vegetables and fruits. Do not wash under the tap.
(vi) Avoid wastage of water while washing your face.
(vii) Use a mug instead of running tap water while shaving.
(viii) Take bath with a bucket of water instead of shower or running tap.
(ix) Take water in a bucket to wash the utensils.
(x) Do not wash the utensils under the faucet.
(xi) Automatic switch off mechanism must be fitted on the water tank at home as it overflows frequently.

(7) Write briefly few incidents of water wastage in your area.

Ans.

[Students are expected to answer this question on their own.]

(8) What are the habits to be adopted to avoid wastage of water in the house?

Ans.

The habits to be adopted to avoid wastage of water in the house are:

(i) Turn off taps while brushing teeth or washing hands.
(ii) Fix leaking taps, pipes, and toilets immediately.
(iii) Use a bucket instead of a shower for bathing.
(iv) Wash vegetables in a bowl instead of under running water.
(v) Use leftover water from washing vegetables or rice for watering plants.
(vi) Run washing machines and dishwashers only with full loads.
(vii) Collect and reuse rainwater for cleaning or gardening.
(viii) Educate family members about the importance of saving water.

(9) How can you save water in a society/residential colony?

Ans.

In a society/residential colony, water can be saved by the following ways:

(i) Install rainwater harvesting systems on rooftops to collect and store rainwater.
(ii) Fix leaks in common pipelines, tanks, and taps promptly.
(iii) Use treated or recycled water for gardening, cleaning, and flushing.
(iv) Install water meters to monitor usage and promote responsible consumption.
(v) Encourage residents to use water-saving fixtures like low-flow taps and dual-flush toilets.
(vi) Conduct awareness drives and workshops on water conservation.
(vii) Appoint a team or committee to regularly inspect and manage the water supply system.
(viii) Promote community participation in saving water and reporting wastage.

Oral Assessment

(1) What is water literacy?

Ans.

The knowledge and actual action to use the water available in the area carefully and properly is known as water literacy.

(2) How much percentage of water available in Israel comes from wastewater and wastewater recycling?

Ans.

About 21 percent (13.7 TMC) of the water available in Israel comes from wastewater and wastewater recycling.

(3) Name some challenges that Maharashtra is facing with respect to water situation.

Ans.

The challenges that Maharashtra is facing with respect to water situation are:

(i) Improper and excessive use of water
(ii) Civilisation and increasing demand of water
(iii) Lack of planning
(iv) Water pollution
(v) Unequal distribution of water resources
(vi) Drought crisis
(vii) Inadequate utilisation of irrigation capacity

Activities

[Students are expected to perform the given activities on their own.]

Unit 4: Water Quality

Chapter 1 Water Quality and Criteria

Written Assessment

(1) Explain the concept of BOD and COD.

Ans.

BOD

(i) BOD is Biological Oxygen Demand. The bacteria that maintain the quality of water must get the necessary amount of oxygen dissolved in water.
(ii) With less oxygen bacteria won't be able to survive.
(iii) BOD indicates how much oxygen is needed by microbes to decompose organic matter in water.
(iv) A higher BOD level signifies greater amount of organic matter in the water.

COD

(i) COD is Chemical Oxygen Demand. The chemical oxygen requirement of water is examined from the point of view of checking the efficiency of the sewage treatment plant.
(ii) If organic matter dissolved is more, COD is higher.
(iii) If the COD of water is high, it is considered to be harmful to the aquatic organisms.
(iv) The COD in water should not exceed 250 mg per litre.

(2) Mention any four criteria for drinking water quality.

Ans.

The criteria for drinking water quality are:

(i) Turbidity	(ii) pH
(iii) Taste	(iv) Odour
(v) Dissolved oxygen levels	(vi) Colour
(vii) Smell	(viii) Dissolved salts

(3) Write a definition of contaminated water.

Ans.

Contaminated water is the water that contains harmful substances such as chemicals, sewage, dirt, and disease-causing microbes, making it detrimental for drinking, cooking, and other purposes.

(4) Write the things that are necessary to make water drinkable.

Ans.

The things that are necessary to make water drinkable are:

(i) The water should be good in taste. It should not be brackish, salty or oily.
(ii) It should be crystal clear, colourless and transparent (showing bottom).
(iii) The water should not have odour, no algae or oily layer.
(iv) Harmful chemicals should not be overdosed or not at all.
(v) It should not contain harmful bacteria or viruses.
(vi) The pH of water should be 6.5 to 8.5.
(vii) Water should be stored in a clean, covered and convenient container.

(5) Explain the experiment of New Water in Singapore.

Ans.

(i) In Singapore, the problem of water shortage is very acute.
(ii) In order to solve the water problem, Singapore imports water from Malaysia through a long-term agreement.
(iii) In spite of going for desalination of sea water, the country was unable to fulfil its demands. Hence, they performed another experiment.
(iv) The wastewater generated in the cities is purified to such an extent, that it is also used for drinking.
(v) For this, 47 different tests are done and only then the water is used.
(vi) This water is called New Water.
(vii) Initially, the public strongly opposed to use this water. But through government efforts and with the help of the media, they were convinced that the water was pure.

(6) How is water polluted by nature and humans?

Ans.

Water pollution by nature

(i) When rainwater travels from highlands to plain grounds, it comes in contact with various objects.

(ii) Water seeps into the ground, where it goes through soil, rocks, and loam. These have traces of salts, chemicals, and minerals that pollute the water.
(iii) Arsenic, a toxic chemical is found in large quantity in the soil in the Konkan region which causes water pollution.

Water pollution by humans

(i) Water pollution is caused due to man-made causes such as domestic sewage, chemical fertilizers and pesticides, and water containing a mixture of chemicals and minerals from industries and factories.
(ii) Sewage is generated in homes, farms, and industries discharged into the drains without being treated. These runnels flow into the rivers, thus polluting them.

(7) On which factors does the amount of dissolved oxygen depend on?

Ans.

The amount of dissolved oxygen depends on temperature, air pressure, and salinity of water.

Oral Assessment

(1) What is the pH range of groundwater?

Ans.

The pH range of groundwater is 6.0 to 8.5.

(2) What is the pH of soap water?

Ans.

The pH of soap water is 10.

(3) What is the maximum permissible limit of COD in water?

Ans.

The maximum permissible limit of COD in water is 250 mg per litre.

(4) What is a universal indicator used for?

Ans.

The universal indicator is used for measurement of pH.

Activities

[Students are expected to perform the given activities on their own.]

Chapter 2 How to Maintain The Quality of Water?

Written Assessment

(1) Which steps are used in purification of water?

Ans.

The various steps used in purification of water are:

(i) Coagulation
(ii) Flocculation
(iii) Sedimentation
(iv) Filtration
(v) Disinfection (Chlorination)

(2) How to maintain the quality of water?

Ans.

The quality of water can be maintained by:

(i) Removing of floating substances
(ii) Settling down the sludge
(iii) Softening the water (if needed)
(iv) Filtration
(v) Sterilisation of chlorine gas

(3) Prepare slogans on the topic 'pure drinking water for health.'

Ans.

(i) Clean water is a necessity, not a luxury.
(ii) Pure Water, Pure Health – Every Drop Matters
(iii) Don't risk your health – Drink only pure water.
(iv) Pure Water, Healthy Body, Happy Life
(v) Water purity is health security.

(4) What is Orthotolidine (OT) test? Why should it be performed?

Ans.

(i) The Orthotolidine (OT) test is a method used to determine the total, free, and mixed chlorine in water quickly and precisely.
(ii) This test is performed to ensure adequate disinfection in water treatment by confirming the presence of sufficient chlorine to kill the harmful microbes.
(iii) If the OT test is positive, well water or hand pump water purification has the expected benefit of bleaching powder.

(5) What are the available sources of water?

Ans.

The available sources of water are:

Natural

- Rainwater
- Rivers

- Lakes
- Ponds
- Streams
- Springs

Artificial

- Dams
- Wells
- Tube wells
- Canals
- Hand pumps

(6) What steps should be taken to maintain the amount of chlorine in bleaching powder? What will happen if it is not done?

Ans.

(i) Bleaching powder should be kept in a sealed container to maintain the amount of chlorine.
(ii) If it is not done, chlorine gas will be released in the air, resulting in weakening of the powder overtime.

Oral Assessment

(1) Why is chlorination of water carried out?

Ans.

Chlorination of water is carried out to disinfect it by killing the germs and viruses.

(2) How much percentage of chlorine should be present in fresh bleaching powder?

Ans.

Fresh bleaching powder should contain more than 33 percent chlorine.

(3) Name some diseases that can be caused due to drinking water contamination.

Ans.

Diseases that can be caused due to drinking water contamination are jaundice, cholera, typhoid, dysentery, gastroenteritis, etc.

Activities

Take turbid water and roll a piece of alum in it. Observe the effect on the water.

Ans.

- Immediately after adding alum: No significant change in the appearance of water.
- After a few minutes: Tiny particles in the water start to clump together (coagulation).
- After 15–30 minutes: The suspended particles settle down at the bottom, and the water becomes visibly clearer.
- Final result: A layer of sediment (settled particles) forms at the bottom, and relatively clear water remains on top.

Chapter 3 Water Pollution: Causes, Effects, and Remedies

Written Assessment

(1) What is water pollution?

Ans.

The natural quality of water changes directly and indirectly due to human action or other causes and water becomes unusable for any purpose. This is known as water pollution.

(2) Write down the factors that cause water pollution.

Ans.

The factors that cause water pollution are:

Household discharge	This includes water coming out of the tank, human urine in urinals, bath water, animal excreta
Substances from industrial premises	Oil, grease released from washing vehicles mixed with water.
Agricultural factors	Chemical fertilizers or pesticides given to the crops. Chemicals get mixed in the water bodies due to excess water given to crops.
Factory wastes	Sewage, minerals, and chemical wastes coming out from the factory.
Sludge	Sewage sludge and watershed sludge
Hot water	Hot water released after processing in factory boiler.

(3) Explain with example how the oil spill in the sea harms the environment.

Ans.

(i) When oil is being traded from the Gulf countries to other countries, the ships crash, resulting in oil spills of million of tones in the seawater.
(ii) When the oil reaches the coastal areas, it causes a lot of damage to the environment.
(iii) Marine oil spills affect the mangroves that are present on the ground. Their biological breathing stops, resulting in them drying up.
(iv) The leaves turn yellow and then fall off due to the oil layers on the leaves.
(v) A natural thin layer of oil is formed on the wings of birds, hence water does not stick.
(vi) When birds come in contact with spilled oil, the oil penetrates their wings, affecting their functioning and making it impossible for them to fly.
(vii) The birds become heavy and drown in the sea.

(4) Write down the functions of the MPCB.

Ans.

The functions of the Maharashtra Pollution Control Board (MPCB) are:

(i) Planning of comprehensive programs for pollution prevention and control.

(ii) Inspection of sewage or industrial wastewater recycling reaction, waste disposal facilities.
(iii) Cooperation and promotion of eco-friendly programs like pollution control, reusing and recycling of waste materials.
(iv) Educate and guide new entrepreneurs by explaining appropriate technology and methods of pollution control.
(v) To create awareness among the people for a clean and healthy environment as well as to address pollution related complaints.

(5) In what ways does sea pollution occur?

Ans.

(i) Sea pollution occurs through various human activities that introduce harmful substances into the sea.
(ii) Industrial waste, containing toxic chemicals and heavy metals, is often dumped directly into the sea.
(iii) Sewage and untreated wastewater from cities also flow into oceans, contaminating marine ecosystems.
(iv) Oil spills from ships and offshore drilling release large amounts of petroleum, severely affecting marine life.
(v) Plastic waste, especially single-use plastics, ends up in the ocean, harming fish, seabirds, and turtles.
(vi) Agricultural run-off carrying pesticides and fertilizers leads to algal blooms and dead zones.
(vii) Sea pollution degrades water quality, threatens biodiversity, and disrupts the balance of marine life.

(6) Mention the powers of the Maharashtra Pollution Control Board.

Ans.

The powers of the Maharashtra Pollution Control Board are:

(i) Enforcement of Environment Act and Pollution Control Act.
(ii) Determining pollution standards and checking their compliance.
(iii) Monitoring and controlling all sources of pollution.
(iv) To fulfil the legal requirements by giving instructions within the prescribed period.
(v) Resolving worrying cases violating pollution regulations.
(v) To sue in a court of law in a matter of concern.

Oral Assessment

(1) Where does your household waste go?

Ans.

Household wastewater typically goes into a sewage system, which directs it to a treatment plant for cleaning before it is released into water bodies like the seas. In rural areas, it may go into a septic tank or local drainage systems.

(2) In your village, where waste water is mixed, what substances are seen to have accumulated? Where do all these substances come from?

Ans.

In the village, wastewater often mixes in open drains or ponds, where accumulated substances like food particles, soap, detergent, oil, plastic bits, and human or animal waste can be seen. These

substances come from household activities such as washing, bathing, cooking, cleaning, and from agricultural run-off or nearby shops and livestock areas.

(3) There are two forms of river in the picture. A river flowing through nature and a river flowing through human habitat. What is the difference between the two rivers? Discuss this. What do you think what is the reason for the change in the river?

Ans.

The river flowing through nature appears clean, clear, and surrounded by greenery. It supports fish, plants, and birds, showing a healthy ecosystem. In contrast, the river flowing through human habitat looks polluted, with garbage, dirty water, and fewer signs of life.

The main difference is in water quality and cleanliness—the natural river remains unpolluted, while the river near human settlements is polluted.

The reason for this change is human activity: disposal of sewage, industrial waste, plastic, and chemicals into the river without proper treatment. Urbanisation and lack of waste management lead to the pollution of the river, harming both the environment and health.

(4) Name the diseases caused due to pathogenic microbes in water.

Ans.

The diseases caused due to pathogenic microbes in water are typhoid, dysentery, jaundice, cholera, etc.

(5) Is the intensity of pollution higher on beach or in sea?

Ans.

The intensity of pollution is usually higher on the beach (shoreline) than in the open sea.

This is because waste from rivers, drains, and human activities like tourism, fishing, and littering collects along the coast. Plastics, sewage, oil, and other pollutants often accumulate at the beach, where water movement is slower, and clean-up is more difficult. In contrast, the open sea may dilute pollutants over a larger area, though deep-sea pollution is still a major problem.

(6) Describe the accidents related to pollution in the sea.

Ans.

Some of the accidents related to pollution in the sea are:

(i) In August 2010, MSC Chitra and MV Khalija-3 collided in Arabian Sea, near Mumbai. This collision caused a huge oil spill in the sea. Nearly 800 tones of oil spilled into the sea, and spilled over a distance of 100-120 km off the coast.
(ii) In January 2017, near Kamraj Port in Chennai, about 60 tones of oil spilled from the collision of the two ships.

Activities

[Students are expected to perform the activities given on their own.]