

Water Resources

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FACTS AT YOUR FINGERTIPS

- ➔ **Fresh water:** 96.5 per cent of the total volume of world's water is estimated to exist as oceans and only 2.5 per cent exists as fresh water. 70 per cent of the fresh water occurs as ice sheets and glaciers in Antarctica, Greenland and the mountainous regions of the world. Less than 30 per cent is stored as groundwater in the world's aquifers. Fresh water is mainly obtained from surface run off and ground water. This is continually being renewed and recharged through the hydrological cycle. All the water moves within the hydrological cycle making water a renewable resource.
- ➔ **Three fresh water sources are:** Precipitation—from rainfall; Surface water—in rivers, lakes, etc.; Ground water—water stored in underground aquifers which gets recharged by rainfall.
- ➔ **Water scarcity:** Water scarcity means shortage of water. It is usually associated with regions having low rainfall or drought prone areas.
There are many other reasons which lead to scarcity of water: Large growing population; In the agricultural sector, water resources are being over-exploited to expand irrigated areas and dry-season agriculture; More water required for irrigation purposes to facilitate higher food production, *i.e.*, for doing multiple cropping and for HYV seeds; There is greater demand for water with growing urbanisation and industrialisation; An unequal access to water among different social groups; The quality of water is deteriorating, *i.e.*, getting polluted by domestic and industrial wastes, chemical fertilizers and pesticides used in agriculture; Excessive use of water by industries which also require water to generate hydro-electric power to run them; and Over exploitation of water in the urban areas.
- ➔ **Adverse effects of over-exploitation of ground water resources:**
 - Pumping out more water from under the ground may lead to falling ground water levels.
 - It will adversely affect water availability.
 - This, in turn, will affect our agriculture and food security of the people.
 - Impoverishment of water resources may adversely affect the ecological cycle.
- ➔ **Main causes of water pollution:** Domestic wastes especially urban sewers; industrial wastes are disposed off in the water without proper treatment; chemical effluents from industries and from agricultural sector; and many human activities, *for example*, religious rituals and immersing of idols, etc. in the water also pollute water.
- ➔ **Measures for water conservation:**
 - Do not overdraw the ground water, recharge it by techniques like rainwater harvesting; tapping rainwater in reservoirs, watershed development programmes, etc.

- Avoid wastage of water at all levels and do not pollute the water.
- Adopting water conserving techniques of irrigation, for example, drip irrigation and sprinklers etc., especially in dry areas.

➔ A **dam** is a barrier across flowing water that obstructs, directs or retards the flow, creating a reservoir, lake or impoundment. A dam is the reservoir and not the whole structure.

Related Concept

Kallanai Dam/Grand Anicut is the oldest dam in India. The dam was built in the 2nd century AD by King Karikalan Chola of the Chola Dynasty.

➔ **Multipurpose river valley projects—‘The Temples of Modern India’:** Jawahar Lal Nehru proclaimed that multipurpose projects are ‘The Temples of Modern India’, because they were thought of as the vehicle that would lead the nation to development and progress. He believed that these projects with their integrated water resource management approach would integrate development of agriculture and the village economy with rapid industrialisation and growth of the urban economy.

Advantages:

- (i) They bring water to those areas which suffer from water scarcity and also provide water for irrigation.
- (ii) These projects generate electricity for industries and our homes.
- (iii) They help in controlling floods.
- (iv) These projects can be used for recreation, inland navigation and fish breeding.

Disadvantages:

- (i) Damming of rivers affects their natural flow causing poor sediment flow.
- (ii) Excessive sedimentation at the bottom of the reservoir.
- (iii) Lack of sediments result in—(a) rockier stream bed and (b) poorer habitat for the river’s aquatic life.
- (iv) The reservoirs submerge the existing vegetation and soil, leading to its decomposition over time.
- (v) They affect the fertility levels of the soil.
- (vi) Cause large scale displacement of local communities.

Related Concept

Damodar river valley project is the first project on river valley development in India. The objectives that are associated with the project are supplying hydroelectric power to the people of West Bengal and Bihar and preventing floods effectively. The Government of India established the project in July 1948.

➔ **Traditional rainwater harvesting methods practised in different parts of the country:**

- In mountainous areas ‘Guls’ and ‘Kuls’ the diversion channels were built for agriculture.
- ‘Rooftop rainwater harvesting’ was commonly practised to store drinking water, especially in Rajasthan.
- Inundation channels for irrigation were developed in the flood plains of West Bengal.
- In arid and semi-arid regions, agricultural fields were converted into rainfed storage structures, for example, ‘Khadins’ in Jaisalmer and ‘Johads’ in other parts of Rajasthan.
- In semi-arid and arid regions of Rajasthan, particularly in Bikaner, Phalodi and Barmer, all the houses had **underground tanks** or ‘tankas’ built inside the house for storing drinking water. They were a part of the well-developed rooftop rainwater harvesting system.

➔ **‘Narmada Bachao Andolan’:** ‘Narmada Bachao Andolan’ or ‘Save the Narmada Movement’ is an NGO that mobilised tribal people, farmers, environmentalists and human rights activists against the Sardar Sarovar Dam being built across the Narmada river in Gujarat. The movement originally focussed on environmental issues related to submerging of trees under the dam water. Recently its aim has been to enable the displaced poor people to get full rehabilitation facilities from the government.

Related Concept

Medha Patkar is an Indian activist and one of the initiators of The Save the Narmada Movement, Narmada Bachao Andolan (NBA). The movement has mobilised people against huge dam projects since the late 1980s.

NCERT Exercise

GEOGRAPHY

1. Multiple choice questions:

(i) Based on information given below classify each of the situations as 'suffering from water scarcity' or 'not suffering from water scarcity'.

- (a) Region with high annual rainfall.
- (b) Region having high annual rainfall and large population.
- (c) Region having high annual rainfall but water is highly polluted.
- (d) Region having low rainfall and low population.

(ii) Which one of the following statements is not an argument in favour of multi-purpose river projects?

- (a) Multi-purpose projects bring water to those areas which suffer from water scarcity.
- (b) Multi-purpose projects by regulating water flow help to control floods.
- (c) Multi purpose projects lead to large scale displacements and loss of livelihood.
- (d) Multi-purpose projects generate electricity for our industries and our homes.

(iii) Here are some false statements. Identify the mistakes and rewrite them correctly.

- (a) Multiplying urban centres with large and dense populations and urban lifestyles have helped in proper utilisation of water resources.
- (b) Regulating and damming of rivers does not affect the river's natural flow and its sediment flow.
- (c) In Gujarat, the Sabarmati basin farmers were not agitated when higher priority was given to water supply in urban areas, particularly during droughts.
- (d) Today in Rajasthan, the practice of rooftop rainwater water harvesting has gained popularity despite high water availability due to the Indira Gandhi Canal.

Ans. (i) Suffering from water scarcity: (b), (c) and (d)
Not suffering from water scarcity: (a)

(ii) (c) Multi-purpose projects lead to large scale displacements and loss of livelihood.

(iii) (a) Multiplying urban centres with large and dense populations and urban lifestyles **have not helped** in proper utilisation of water resources.

(b) Regulating and damming of rivers **affect** the river's natural flow and its sediment flow.

(c) In Gujarat, the Sabarmati basin farmers were agitated when higher priority was given to water supply in urban areas, particularly during droughts.

(d) Today in Rajasthan, the practice of rooftop rainwater water harvesting is on the decline as plenty of water is available due to the Indira Gandhi Canal.

2. Answer the following questions in about 30 words.

(i) Explain how water becomes a renewable resource.

(ii) What is water scarcity and what are its main causes?

(iii) Compare the advantages and disadvantages of multi-purpose river projects.

Ans. (i) — Fresh water is mainly obtained from **surface run off** and **ground water**. This is continually being renewed and recharged through the hydrological cycle.

— All the water moves within the hydrological cycle making water a renewable resource.

(ii) Water scarcity means shortage of water. It is usually associated with regions having low rainfall or drought prone areas. There are many other reasons which lead to scarcity of water.

These are:

(i) Large growing population—means more water required for domestic use and also to produce more food.

(ii) In the agricultural sector, water resources are being over-exploited to expand irrigated areas and dry-season agriculture.

(iii) More water required for irrigation purposes to facilitate higher food production, i.e., for doing multiple cropping and for HYV seeds.

(iv) There is greater demand for water with growing urbanisation and industrialisation.

(v) An unequal access to water among different social groups.

(vi) The quality of water is deteriorating, i.e., getting polluted by domestic and industrial wastes, chemical fertilizers and pesticides used in agriculture.

(vii) Excessive use of water by industries which also require water to generate hydro-electric power to run them.

(viii) Over exploitation of water in the urban areas. Housing societies and colonies have their own ground-water pumping devices.

This causes depletion of fragile water resources in the cities.

(iii) Advantages:

- (i) They bring water to those areas which suffer from water scarcity and also provide water for irrigation.
- (ii) These projects generate electricity for industries and our homes.
- (iii) They help in controlling floods by regulating the water flow.
- (iv) These projects can be used for recreation, inland navigation and fish breeding.

Disadvantages:

- (i) They have failed to achieve the purpose for which they were built.
- (ii) The dams that were constructed to control floods have triggered floods due to sedimentation in the reservoir.
- (iii) The big dams have mostly been unsuccessful in controlling floods at the time of excessive rainfall.
- (iv) These floods cause extensive soil erosion in addition to loss of life and property.
- (v) Sedimentation deprives the flood plains of silt, a natural fertiliser.
- (vi) It was observed that these projects induced earthquakes.
- (vii) Floods cause water-borne diseases and pests.
- (viii) Results in pollution also.
- (ix) These river valley projects lead to large scale displacement of people and loss livelihoods.

3. Answer the following questions in about 120 words.

(i) Discuss how rainwater harvesting in semi-arid regions of Rajasthan is carried out.

(ii) Describe how modern adaptations of traditional rainwater harvesting methods are being carried out to conserve and store water.

Ans. (i) 'Rooftop rainwater harvesting' was commonly practiced to store drinking water, especially in semi-arid and arid regions like Bikaner, Phalodi and Barmer in Rajasthan.

(a) In semi-arid and arid regions, all the houses had underground tankas or

'tankas' for storing drinking water built inside the house. They were the part of the well-developed rooftop rainwater harvesting system.

(b) The tankas could be as large as a big room. One household in Phalodi had a tank that was 6.1 metres deep, 4.27 metres long and 2.44 metres wide.

(c) The tankas were built inside the main house or the courtyard.

(d) The tanks were connected to the sloping roofs of the houses through a pipe. The falling rain would travel down the pipes and get stored in the underground 'tankas'. The first spell of rain would not be collected as it cleaned the roof and pipes. The rainwater from subsequent showers was collected.

(e) Many houses constructed underground rooms adjoining the tanka to beat the summer heat as it would keep the room cool.

(ii) (a) In modern times, rainwater harvesting is done in both rural and urban areas to recharge the groundwater by capturing and storing rainwater by constructing structures, e.g., dugwells, percolation pits, digging trenches around fields, etc.

(b) Rooftop rainwater harvesting structures are a common practice in many cities. Rain-water is collected using a PVC pipe and is filtered using sand and bricks.

(c) This water can be stored to meet the household needs through storage in tanks. This water is readily available for immediate usage.

(d) Excess water or a pipe can be connected to an underground reservoir which may recharge the ground-water through hand-pump or through abandoned dugwell. Later, this water can be drawn for varied uses.

(e) Storage tanks/reservoirs are built to store rainwater which is later used for irrigation purposes.





SUBJECTIVE TOPIC-1

Water Scarcity & the Need for Water Conservation & Management

Short Answer Type Questions (SA-I) (Easy)

(1 Mark)

1. What percentage of global precipitation does India receive?

Ans. India receives nearly 4 per cent of the global precipitation.

2. Where is India ranked in terms of water availability per person per annum? By what year will India join countries having absolute water scarcity?

Ans. India ranks 133 in the world in terms of water availability per person per annum. By 2025, large parts of India will join countries having absolute water scarcity.

3. Give an estimate of India's renewable water resources.

Ans. The total renewable water resources of India are estimated at 1897 sq km per annum.

4. What is the present condition of Indian rivers?

Ans. India's rivers, especially the smaller ones have turned into toxic streams. Even the bigger ones like the Ganga and the Yamuna are slowly getting polluted.

5. Write three sources of fresh water.

Ans. Three sources are:

- (i) Precipitation—from rainfall.
- (ii) Surface water—in rivers, lakes, etc.
- (iii) Ground water—water stored in underground aquifers which gets recharged by rainfall.

Short Answer Type Questions (SA-II) (Average)

(2-3 Marks)

6. Give some facts and figures about the water resources in the world.

- Ans. — 96.5 per cent of the total volume of world's water is estimated to exist as oceans and only 2.5 per cent exists as fresh water.
- 70 per cent of the fresh water occurs as ice sheets and glaciers in Antarctica, Greenland and the mountainous regions of the world. Less than 30% is stored as groundwater in the world's aquifers.

7. Explain how water becomes a renewable resource?

- Ans. — Fresh water is mainly obtained from **surface run off** and **ground water**. This is continually being renewed and recharged through the hydrological cycle.
- All the water moves within the hydrological cycle making water a renewable resource.

8. Write the adverse effects of over-exploitation of ground water resources.

Or, Analyse the impact of 'water scarcity.'

(2019 Series: JMS/1)

Ans. Water scarcity means shortage of water. It is usually associated with regions having low rainfall or drought-prone areas.

Impact of water scarcity:

- (i) Pumping out more water from under the ground may lead to falling ground water levels.
- (ii) It will adversely affect water availability.
- (iii) This, in turn, will affect our agriculture and food security of the people.
- (iv) Impoverishment of water resources may adversely affect the ecological cycle.

9. Write the main causes of water pollution.

Ans. **Water gets polluted by:**

- (i) Domestic wastes, especially urban sewers.
- (ii) Industrial wastes are disposed off in the water without proper treatment.
- (iii) Chemical effluents from industries and from agricultural sector.
- (iv) Pesticides and fertilisers used in agriculture may get washed into rivers by rain-water and may pollute the water by enriching it with minerals.
- (v) Many human activities, for example, religious rituals and immersing of idols, etc. in the water also pollute water.

Long Answer Type Questions (LA) (Difficult)

(5 Marks)

10. What is water scarcity? Write the main reasons for water scarcity. (2015)

Or, "Water scarcity may be an outcome of large and growing population in India." Analyse the statement. (2019 Series: JMS/1)

Ans. Water scarcity means shortage of water. It is usually associated with regions having low rainfall or drought prone areas. There are many other reasons which lead to scarcity of water.

These are:

- (i) Large growing population—means more water required for domestic use and also to produce more food.
- (ii) In the agricultural sector, water resources are being over-exploited to expand irrigated areas and dry-season agriculture.
- (iii) More water required for irrigation purposes to facilitate higher food production, i.e., for doing multiple cropping and for HYV seeds.
- (iv) There is greater demand for water with growing urbanisation and industrialisation.
- (v) An unequal access to water among different social groups.
- (vi) The quality of water is deteriorating, i.e., getting polluted by domestic and industrial wastes, chemical fertilizers and pesticides used in agriculture.
- (vii) Excessive use of water by industries which also require water to generate hydro-electric power to run them.
- (viii) Over exploitation of water in the urban areas. Housing societies and colonies have their own ground-water pumping devices. This causes depletion of fragile water resources in the cities.

11. How intensive industrialisation and urbanisation have posed a great pressure on existing fresh water resources in India? Explain with two examples for each. (2012)

Ans. Intensive industrialisation and urbanisation have put greater pressure on existing fresh water resources.

With the ever-growing number of industries, the demand for water has grown tremendously:

- (i) Industries are heavy users of fresh water as water is required for cooling the machines as well as for the processing of goods.
- (ii) Also the machines run on the power supplied by the hydel power plants.
- (iii) 22 percent of the total electricity is hydro-electric power.
- (iv) Rapid urbanisation has led to expansion of industries which increased the requirement of water.
- (v) The untreated industrial effluents which are discharged into water bodies are polluting the water and making it hazardous for human consumption. This is responsible for creating water scarcity.

On the other hand, multiplying urban centres with:

- (i) large urban populations and

- (ii) urban lifestyles have not only added to water and energy requirements but have further aggravated the problem by over-drawing the groundwater by using their own groundwater pumping devices for meeting their water needs for domestic purposes such as cleaning, cooking, washing, etc.

Thus, water resources are being over-exploited which has caused their depletion in several cities.

12. What is the need for conservation of water resources? (2015)

Ans. **Need for conservation of water resources means:**

- (i) our water resources are limited and our requirements are increasing day by day. The water resources are unevenly distributed.
- (ii) most of our resources especially in the cities and urban areas are polluted and unsuitable for drinking and other purposes.
- (iii) to safeguard ourselves from health hazards.
- (iv) we need to conserve water for the continuation of our livelihoods and to prevent degradation of our natural ecosystem. To ensure food security and for continuation of our livelihoods.
- (v) for productive activities of the nation.
- (vi) to prevent degradation of our natural ecosystem.

13. Write some measures adopted for conservation of water resources. (2015)

Ans. **Measures for water conservation:**

- (i) Do not overdraw the ground water, recharge the ground water by techniques like rainwater harvesting.
- (ii) Avoid wastage of water at all levels.
- (iii) Do not pollute the water.
- (iv) Increasing the water resources by tapping the rainwater in reservoirs, watershed development programmes, etc.
- (v) Adopting water conserving techniques of irrigation, for example, drip irrigation and sprinklers etc., especially in dry areas. Sufficient water percolation facilities should be increased to help in raising the level of the water table.

Related Concept

Remember it is very important to conserve water resources as conserving water saves energy. Energy is needed to filter, heat and pump water to our home, so conservation of water reduces carbon footprint. Using less water keeps more in our ecosystems and helps to keep wetland habitats topped up for animals like otters, water voles, herons and fish.



SUBJECTIVE TOPIC-2

Multi-Purpose River Projects and Integrated Water Resources Management

Short Answer Type Questions (SA-I) (Easy)

(1 Mark)

14. What percentage of total electricity produced comes from hydro-electricity?

Ans. 22 per cent of the total electricity produced is hydro-electric power.

15. Name two multipurpose projects and the rivers on which they are respectively situated.

Ans. (i) Hirakud Project is situated on river Mahanadi in Odisha, and
(ii) Bhakra Nangal Project is situated on river Sutlej.

16. Give an example of an inter-state water dispute.

Ans. *Krishna-Godavari dispute*. The Karnataka and Andhra Pradesh Governments objected to the diversion of more water at Koyna by the Maharashtra government for a multipurpose project as this results in reduction of downstream flow to Karnataka and Andhra Pradesh adversely affecting agriculture and industry in these States.

Short Answer Type Questions (SA-II) (Average)

(2-3 Marks)

17. Explain any three problems faced by local communities due to the construction of large dams.

(2013, 2017)

Ans. *Problems faced by local communities due to the construction of large dams:*

- (i) Dams have resulted in large-scale displacement of local communities.
- (ii) Local people have to give up their land and livelihood.
- (iii) Local people do not benefit from such projects as they are even deprived of the local resources on which they have little control.
- (iv) Many settlements and agricultural lands are submerged under water.

18. What are the social consequences of multipurpose projects?

Or, Multipurpose projects have transformed the social landscapes. Explain.

Ans. (i) Local people, especially the landless people, did not gain from these projects.

(ii) It led to displacement of people which deprived the people of their land and livelihood.

(iii) It has increased the social gap between the richer landowners and the landless poor.

(iv) Dams created conflicts between people wanting different uses and benefits from the same water resources.

(v) Inter-state water disputes are also becoming common with regard to sharing the costs and benefits of the multipurpose projects.

19. What is the main difference between traditional dams and modern dams?

Ans. Traditionally dams were built to impound rivers and rainwater that could be used later to irrigate the agricultural fields.

Today, dams are referred to as multipurpose projects where many uses of the impounded water are integrated with one another. The main purposes served by these projects are irrigation, electricity generation, flood control, water supply for domestic and industrial use, fish breeding and tourism.

20. How do dams help to conserve and manage water?

Ans. *Dams help to conserve and manage water in the following ways:*

(i) A dam is a barrier that stops or restricts the flow of water or underground streams. Reservoirs created by dams not only suppress floods but also provide water for activities such as irrigation, human consumption, industrial use, aquaculture, and navigability. Hydropower is often used in conjunction with dams to generate electricity.

(ii) A dam can also be used to collect water or for storage of water which can be evenly distributed between locations. Dams generally serve the primary purpose of retaining water, while other structures such as floodgates or levees (also known as dikes) are used to manage or prevent water flow into specific land regions.

21. Multipurpose projects and dams have been the cause of many new social movements. Name two such social movements and write the underlying causes for these movements.

Ans. Resistance to these projects came from social movements, for example, (i) 'Narmada Bachao Andolan' and (ii) 'Tehri Dam Andolan'.

Their major concerns were as follows:

(i) Initially the environmental concerns were of utmost importance.

- (ii) Dams have resulted in large-scale displacement of local communities.
- (iii) Local people have to give up their land and livelihood.
- (iv) Local people do not benefit from such projects as they are even deprived of the local resources on which they have little control.
- (v) Many settlements and agricultural lands are submerged under water.
- (vi) Rehabilitation of the displaced persons is now the prime concern of these movements.

22. Give a brief description of the 'Narmada Bachao Andolan'.

Ans. Narmada Bachao Andolan or Save Narmada Movement is an NGO (Non-Governmental Organisation) that mobilised tribal people, farmers, environmentalists and human rights activists against the Sardar Sarovar Dam being built across the Narmada river in Gujarat.

- The movement originally focussed on environmental issues related to submerging of trees under the dam water.
- Recently its aim has been to enable the displaced poor people to get full rehabilitation facilities from the government.

Long Answer Type Questions (LA) (Difficult) (5 Marks)

23. What were the different types of hydraulic structures constructed in Ancient India? Give examples.

Ans. The different types of hydraulic structures were:

- Dams built of stone rubble, for example, during Chandragupta Maurya's time, dams, lakes and irrigation systems were extensively built.
- Reservoirs or lakes like the Bhopal lake of the 11th century which was one of the largest artificial lakes of its time.
- Embankments and canals for irrigation. Sophisticated irrigation works have been found in Kalinga (Odisha), Kolhapur (Maharashtra), Nagarjunakonda (Andhra Pradesh) etc.
- Many tanks were built to store rainwater, for example, the tank in Hauz Khas in Delhi was built in 14th century to supply water to Siri Fort area.

24. How was water conserved in ancient India? Give any four examples in support of your answer. (2012)

Ans. Archaeological and historical records show that from ancient times India has been constructing sophisticated hydraulic structures like dams, reservoirs, embankments and canals for irrigation.

- (i) For example, in the first century B.C., Allahabad had sophisticated water harvesting system channelling the flood water of the river Ganga.
- (ii) During the time of Chandragupta Maurya, dams, lakes and irrigation systems were extensively built.
- (iii) Sophisticated irrigation works have been found in Kalinga in Odisha, Nagarjunakonda in Andhra Pradesh, Bennur in Karnataka and Kolhapur in Maharashtra.
- (iv) Bhopal lake, built in the 11th century, was one of the largest artificial lakes of its time.
- (v) In the 14th century, Iltutmish constructed a tank in Hauz Khas, Delhi for supplying water in Siri Fort area.

Related Concept

Water conservation in India is not a new concept. One of the earliest sites of the Indus valley civilisation, Dholavira in the Gujarat state has well documented storage reservoirs in the form of lakes to collect surface run offs during the rainy season.

25. What is a dam? Describe the functioning of dams? On what basis are dams classified into different types?

Ans. A dam is a barrier across flowing water that obstructs, directs or retards the flow, creating a reservoir, lake or impoundment. A dam is the reservoir and not the whole structure.

Functioning. Most dams have a section called spillway or weir over which or through which, water will flow intermittently or continuously.

Classification. Dams are classified according to structure, intended purpose or height.

- According to structure and materials used, they are classified as timber dams, embankment dams or masonry dams.
- According to height, they are classified as large and major dams, low dams, medium height dams and high dams.

26. Why are multipurpose river valley projects called 'The Temples of Modern India'? Who first made this statement? (2014)

Or, Jawahar Lal Nehru proudly proclaimed the 'Dams as the Temples of Modern India'. Analyze this statement. (2013)

Ans. Jawahar Lal Nehru proclaimed that multipurpose projects are 'The Temples of Modern India', because they were thought of as the vehicle that would lead the nation to development and progress. He believed that these projects with their integrated water resource management approach would integrate development of agriculture and the village economy with rapid industrialisation and growth of the urban economy.

Dams or multi-purpose river valley projects have the following advantages:

- (i) They bring water to those areas which suffer from water scarcity and also provide water for irrigation.
- (ii) These projects generate electricity for industries and our homes.
- (iii) They help in controlling floods by regulating the water flow.
- (iv) These projects can be used for recreation, inland navigation and fish breeding.

27. Compare the advantages and disadvantages of multi-purpose river valley projects.

Or, "Multi-purpose projects have failed to achieve the purpose for which they were built." Justify the statement.

Ans. **Advantages:**

- (i) They bring water to those areas which suffer from water scarcity and also provide water for irrigation.
- (ii) These projects generate electricity for industries and our homes.
- (iii) They help in controlling floods by regulating the water flow.
- (iv) These projects can be used for recreation, inland navigation and fish breeding.

Disadvantages:

- (i) They have failed to achieve the purpose for which they were built.
- (ii) The dams that were constructed to control floods have triggered floods due to sedimentation in the reservoir.
- (iii) The big dams have mostly been unsuccessful in controlling floods at the time of excessive rainfall.
- (iv) These floods cause extensive soil erosion in addition to loss of life and property.
- (v) Sedimentation deprives the flood plains of silt, a natural fertiliser.
- (vi) It was observed that these projects induced earthquakes.
- (vii) Floods cause water-borne diseases and pests.
- (viii) Results in pollution also.
- (ix) These river valley projects lead to large scale displacement of people and loss livelihoods.

28. 'Construction of dams on rivers has caused environmental degradation.' Give reasons to support this statement.

(2015)

- Ans. (i) Damming of rivers affects their natural flow causing poor sediment flow.
- (ii) Excessive sedimentation at the bottom of the reservoir.
- (iii) Lack of sediments results in (a) rockier stream bed and (b) poorer habitat for the river's aquatic life.
- (iv) Dams also fragment rivers, making it difficult for aquatic fauna to migrate, especially for spawning.
- (v) The reservoirs submerge the existing vegetation and soil, leading to its decomposition over time.
- (vi) Flood plains are deprived of silt and khadar, affecting the fertility levels of the soil.
- (vii) Construction of dams also faces resistance because of large scale displacement of local communities.

29. "Multi-purpose projects and large dams have been the cause of many new social movements." Highlight the concerns related to such movements.

(2019 Series: JMS/4)

- Ans. (i) Multi-purpose projects and large dams have been the cause of many new social movements like the 'Narmada Bachao Andolan' and the 'Tehri Dam Andolan', etc.
- (ii) Regulating and damming of rivers has affected their natural flow causing poor sediment flow. This has resulted in rockier stream beds.
- (iii) Resistance to these projects has primarily been due to the large-scale displacement of local communities.
- (iv) Local people often have had to give up their land, livelihood and their meager access and control over resources for the greater good of the nation.
- (v) Many settlements and agricultural lands are submerged under water.
- (vi) The social landscape has been transformed. It has increased the gap between rich landowners and landless poor.
- (vii) Dams have created conflicts between people wanting different uses and benefits from the same water resources.
- (viii) In Gujarat, the Sabarmati basin farmers were agitated.
- (ix) Inter-state water disputes are also becoming common with regard to the sharing of costs and benefits of these multi-purpose projects.



SUBJECTIVE TOPIC-3

Rainwater Harvesting

Short Answer Type Questions (SA-I)

(Easy) (1 Mark)

30. Which village in Karnataka has earned the distinction of being rich in rainwater?

Ans. In Gendathur in Mysore, Karnataka, nearly 200 households have installed rooftop rainwater harvesting system.

31. Name the state which has made rooftop rainwater harvesting compulsory.

Ans. Tamil Nadu has made rooftop rainwater harvesting structure compulsory for all houses across the state.

32. When does water stress occur according to Falken Mark, a Swedish expert?

Ans. Water stress occurs when water availability is less than 1000 cubic metre per person per day.

33. Name the unique irrigation system prevalent in Meghalaya.

Ans. Bamboo Drip Irrigation System.

34. Name two states where rooftop rainwater harvesting is common practice.

Ans. Shillong, Meghalaya.

35. 'Mawsynram is the region of highest rainfall, yet it faces acute water shortage.' Why?

Ans. Mawsynram faces acute water shortage because the rainwater harvested is not sufficient to meet the needs of the people.

Short Answer Type Questions (SA-II)

(Average) (2-3 Marks)

36. Analyse the importance of 'rainwater harvesting'.
(2019 Series: JMS/1)

Ans. **Importance of rainwater harvesting:**

(i) It can be a viable alternative to the big multipurpose projects.

(ii) It is advantageous socially, economically and environmentally.

(iii) It fulfills water needs keeping in view local ecological conditions.

(iv) It can be used for storing drinking water.

Long Answer Type Questions (LA)

(Difficult) (5 Marks)

37. Describe the traditional method of rainwater harvesting adopted in different parts of India.

Or, "Traditional harvesting system is a useful system to conserve and store water." Highlight the importance of this system with two examples.

(2019 Series: JMS/4)

Ans. **Water harvesting systems are considered safe both socio-economically and environmentally:**

(i) They help to fulfill the water needs of the people.

(ii) They help in irrigation and in recharging ground water.

(iii) They are reliable sources of drinking water when all other sources dry up.

In ancient India, people developed wide-ranging techniques to harvest rainwater.

(i) In mountainous areas 'Guls' and 'Kuls' the diversion channels were built for agriculture.

(ii) 'Rooftop rainwater harvesting' was commonly practised to store drinking water, especially in Rajasthan.

(iii) Inundation channels for irrigation were developed in the flood plains of West Bengal.

(iv) In arid and semi-arid regions, agricultural fields were converted into rainfed storage structures, for example, 'Khadins' in Jaisalmer and 'Johads' in other parts of Rajasthan.

(v) In semi-arid and arid regions of Rajasthan, particularly in Bikaner, Phalodi and Barmer, all the houses had underground tanks or 'tankas' built inside the house for storing drinking water. They were a part of the well-developed rooftop rainwater harvesting system.

Related Concept

A Khadin is an ingenious construction designed to harvest surface runoff water for agriculture. It is also called a Dhora. The Khadin system is based on the principle of harvesting rainwater on farmland and subsequent use of this water-saturated land for crop production.

38. Explain how rooftop rainwater harvesting in semi-arid regions of Rajasthan is carried out.
(2012)

Or, Write the features of the 'tankas' built in the houses of Bikaner, Phalodi and Barmer. (2017 D)

Ans. 'Rooftop rainwater harvesting' was commonly practiced to store drinking water, especially in semi-arid and arid regions like Bikaner, Phalodi and Barmer in Rajasthan.

- (i) In semi-arid and arid regions, all the houses had **underground tankas** or '**tankas**' for storing drinking water built inside the house. They were the part of the well-developed rooftop rainwater harvesting system.
- (ii) The tankas could be as large as a big room. One household in Phalodi had a tank that was 6.1 metres deep, 4.27 metres long and 2.44 metres wide.
- (iii) The *tankas* were built inside the main house or the courtyard.
- (iv) The tanks were connected to the sloping roofs of the houses through a pipe. The falling rain would travel down the pipes and get stored in the underground '*tankas*'. The first spell of rain would not be collected as it cleaned the roof and pipes. The rainwater from subsequent showers was collected.
- (v) Many houses constructed underground rooms adjoining the *tanka* to beat the summer heat as it would keep the room cool.

39. Write how modern adaptations of traditional rainwater harvesting methods are being carried out to conserve and store water.

- Ans. (i) In modern times, rainwater harvesting is done in both rural and urban areas to **recharge the groundwater** by capturing and storing rainwater by constructing structures, *for example*, dugwells, percolation pits, digging trenches around fields, etc.
- (ii) Rooftop rainwater harvesting structures are a common practice in many cities. Rainwater is collected using a PVC pipe and is filtered using sand and bricks.
- (iii) This water can be stored to meet the household needs through storage in tanks. This water is readily available for immediate usage.
- (iv) Excess water or a pipe can be connected to an underground reservoir which may recharge the ground-water through hand-pump or through abandoned dugwell. Later, this water can be drawn for varied uses.
- (v) Storage tanks/reservoirs are built to store rainwater which is later used for irrigation purposes.



2024 CBSE BOARD EXAMINATION

Questions

— 2024 (Series: AB3CD/1) Set-I —

Q.35. Read the given source carefully and answer the questions that follow:

4

Floods

Basic safety Precautions To Be Taken:

- Listen to radio/TV for the latest weather bulletins and flood warnings. Pass on the information to others.
- Make a family emergency kit which should include; a portable radio/transistor, torch, spare batteries, a first aid box along with essential medicines, ORS, dry food items, drinking water, matchboxes, candles and other essential items.
- Keep hurricane lamp, ropes, rubber tubes, umbrella and bamboo stick in your house. These could be useful.
- Keep your cash, jewellery, valuables, important documents etc. in a safe place.
- If there is a flood, move along with your family members and cattle to safe areas like relief camps, evacuation centers, elevated grounds where you can take shelter.
- Turn off power and gas connections before leaving your house.



During floods:

- Don't enter into flood waters; it could be dangerous.
- Don't allow children to play in or near flood waters.
- Stay away from sewerage line, gutters, drains, culverts etc.
- Be careful of snakes; snakebites are common during floods.
- Stay away from electric poles and fallen power-lines to avoid electrocution.
- Don't use wet electrical appliances—get them checked before use.
- Eat freshly cooked and dry food. Always keep your food covered.
- Use boiled and filtered drinking water.
- Keep all drains, gutters near your house clean.
- Stagnation of water can breed vector/water-borne diseases. In case of sickness, seek medical assistance.
- Use bleaching powder and lime to disinfect the surroundings.

35.1 Mention any two essential items that should be included in a 'family emergency kit'.

1

35.2 Why are the items of family emergency kit important during flood situation?

1

35.3 In case of a flood, what are the recommended actions to ensure the safety of your family and belongings?

2

Describe any two.

— 2024 (Series: AABB1/3) Set-I —

Q.8. Which one of the following is the irrigation system in Meghalaya?

1

- To irrigate land only during rainy season.
- To use large volumes of water for irrigation.
- To remove water from soil.
- To use bamboo drip irrigation system.



SCAN ME!
FOR ANSWERS



Competency Based Questions

Stand Alone Multiple Choice Questions

1
mark

GEOGRAPHY

- During whose reign were the dams, lakes and irrigation systems built extensively?
 - Ashoka
 - Chandragupta Maurya
 - Akbar
 - None of these
- What were 'Guls'?
 - Reservoirs
 - Artificial lakes
 - Diversion channels
 - None of these
- How much of the Earth's surface is covered with water?
 - Two-Third
 - Three-Fourth
 - One-Fourth
 - Two-Fourth
- In the 14th century, the tank in Hauz Khas, Delhi was constructed by for supplying water to Siri Fort area.
 - Akbar
 - Iltutmish
 - Babur
 - Ibrahim Lodi
- The earth is occupied mostly with water yet fresh water resources are only
 - 3.5%
 - 5.5%
 - 2.5%
 - 0.5%
- Which one of the following statements is not an argument in favour of multi-purpose river projects?
 - Multi-purpose projects bring water to those areas which suffer from water scarcity.
 - Multi-purpose projects by regulating water flow help to control floods.
 - Multi-purpose projects lead to large scale displacements and loss of livelihood.
 - Multi-purpose projects generate electricity for our industries and our homes.
- How much per cent of the total volume of world's water is estimated to exist in oceans?
 - 95.5%
 - 96%
 - 95%
 - 96.5%
- The primary source of water is
 - evaporation
 - precipitation
 - rain
 - none of these
- We need more and more for growing food.
 - land
 - water
 - minerals
 - none of these
- Which among the following regions of India experience low rainfall and is drought prone?
 - Rajasthan
 - Gujarat
 - Bihar
 - Telangana
- Apart from flood control and irrigation what are the other uses of multipurpose projects?
 - Recreation
 - Fish breeding
 - Inland Navigation
 - All of these
- Which place in India has an artificial lake to conserve water that dates back to 11th century?
 - Delhi
 - Bhopal
 - Bennur
 - Kolhapur
- Who among the following proclaimed the dams as the 'Temples of Modern India'?
 - Mahatma Gandhi
 - Jawaharlal Nehru
 - Motilal Nehru
 - Lal Bahadur Shastri
- Which of the following place or places gets the highest rainfall in the world?
 - Mawsynram
 - Cherrapunji
 - Shillong
 - Both (a) and (b)
- What is the contribution of India's hydro-electric power to the total electricity produced in the country?
 - 22%
 - 30%
 - 40%
 - 50%
- The Hirakud dam is built on which of the following river?
 - Sutlej
 - Beas
 - Mahanadi
 - Krishna
- A tank for storing water that was 6.1 metres deep, 4.27 metres long and 2.44 metres wide was found in
 - Jaisalmer
 - Phalodi
 - Alwar
 - Chittorgarh
- Which of the following remote backward village in Mysore, Karnataka installed household rooftop rainwater harvesting system?
 - Gendathur
 - Vanasthalipuram
 - Chilkunda
 - Kallaha'lli
- How many households have installed Rooftop Rainwater Harvesting system in the Gendathur village?
 - 150 households
 - 175 households
 - 200 households
 - 225 households
- In which part of India, rooftop rainwater harvesting is chiefly practiced?
 - Shillong
 - Eastern Kerala
 - Eastern Rajasthan
 - Western Tamil Nadu

Assertion-Reason Questions

1 mark

DIRECTION: There are two statements marked as Assertion (A) and Reason (R). Read the statements and choose the correct option:

- (a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
- (b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
- (c) Assertion is true but Reason is false.
- (d) Both Assertion and Reason are false.

1. **Assertion.** Water is a renewable resource.
Reason. Freshwater is mainly obtained from surface run off and ground water that is continually being renewed.
2. **Assertion.** The availability of water resources varies over space and time.
Reason. Less availability of water is the main cause of water scarcity.
3. **Assertion.** Dams are referred to as multi-purpose projects.
Reason. Dams are built for irrigation, electricity generation, water supply for domestic and industrial use, flood control, recreation and fish breeding.

4. **Assertion.** Today, in Western Rajasthan, the practice of rooftop rainwater harvesting is on decline.
Reason. Very less water is available due to the Perennial Indira Gandhi canal.
5. **Assertion.** Crops are now sown according to the amount and availability of water.
Reason. Irrigation has changed the cropping pattern.
6. **Assertion.** Irrigation is considered to be the major source of agriculture.
Reason. Dams are well-known for their capacity to hold water for agriculture.
7. **Assertion.** In many regions of Rajasthan, many houses construct underground rooms adjoining the 'tanka'.
Reason. It helps to beat the summer heat as it would keep the room cool.
8. **Assertion.** Growing Population is the main reason for water scarcity.
Reason. Due to growing population, more water for irrigation is required that is mainly responsible for water scarcity.
9. **Assertion.** Ground water is a highly overused resource.
Reason. Ground water is used for domestic and drinking purpose.

Match the Columns

1 mark

1.	Column-A	Column-B	Column-C
	(i) Salal Hydel Project	(a) Mahanadi	1. Gujarat
	(ii) Rana Pratap Sagar Dam	(b) Tungabhadra	2. Telangana and Andhra Pradesh
	(iii) Rihand Dam	(c) Narmada	3. Odisha
	(iv) Nagarjuna Sarovar Dam	(d) Chenab	4. Jammu & Kashmir
	(v) Sardar Sarovar Dam	(e) Chambal	5. Uttar Pradesh
	(vi) Tungabhadra Dam	(f) Krishna	6. Rajasthan
	(vii) Hirakud Dam	(g) Rihand (Tributary of Son)	7. Karnataka
2.	Methods	Different parts of country	
	(i) 'Guls' or 'Kuls'	(a) Other parts of Rajasthan	
	(ii) Johads	(b) Bikaner, Phalodi and Barmer	
	(iii) Khadin	(c) Western Himalayas	
	(iv) Tankas	(d) Jaisalmer	
3.	River-water Disputes	States	
	(i) Krishna-Godavari	(a) Maharashtra	
	(ii) Koyna	(b) Karnataka and Tamil Nadu	
	(iii) Kaveri	(c) Haryana and Delhi	
	(iv) Yamuna	(d) Andhra Pradesh and Karnataka	

4.	Column—A (River)	Column—B (Dam)
	(I) Mahanadi	1. Sardar Sarovar
	(II) Narmada	2. Hirakud
	(III) Chambal	3. Salal
	(IV) Chenab	4. Rana Pratap Sagar

Options:

	I	II	III	IV
(a)	4	3	2	1
(c)	2	1	4	3

(b)	3	4	1	2
(d)	1	2	3	4

(2023)

GEOGRAPHY

Case/Source Based Questions

4-5 marks

I. Archaeological and historical records show that from ancient times we have been constructing sophisticated hydraulic structures like dams built of stone rubble, reservoirs or lakes, embankments and canals for irrigation. Not surprisingly, we have continued this tradition in modern India by building dams in most of our river basins. A dam is a barrier across flowing water that obstructs, directs or retards the flow, often creating a reservoir, lake or impoundment. "Dam" refers to the reservoir rather than the structure. Most dams have a section called a spillway or weir over which or through which it is intended that water will flow either intermittently or continuously. Dams are classified according to structure, intended purpose or height. Based on structure and the materials used, dams are classified as timber dams, embankment dams or masonry dams, with several subtypes. According to the height, dams can be categorised as large dams and major dams or alternatively as low dams, medium height dams and high dams.

Answer the following MCQs by choosing the most appropriate options:

- Who proclaimed the dams as the 'Temples of Modern India'? Why did he call it so?
 - Jawaharlal Nehru; Irrigation became better
 - Mahatma Gandhi; Hydel power became ample
 - Jawaharlal Nehru; It integrated development of agriculture and village economy with rapid industrialisation.
 - Mahatma Gandhi; They are multipurpose in nature.
- What is not the purpose of building dams?
 - For embankments
 - Flood control

- Storage
 - Water animals conservation
- Which of the following is the purpose of building the modern dams?
 - Electricity generation
 - Flood control and Recreation
 - Inland navigation and fish breeding
 - All of the above
 - Bhakra-Nangal project water is being used both for and
 - Irrigation and flood control
 - Irrigation and hydel power production
 - Irrigation and recreation
 - Fish breeding and flood control

II. Many thought that given the disadvantages and rising resistance against the multipurpose projects, water harvesting system was a viable alternative, both socio-economically and environmentally. In ancient India, along with the sophisticated hydraulic structures, there existed an extraordinary tradition of water-harvesting system. People had in-depth knowledge of rainfall regimes and soil types and developed wide ranging techniques to harvest rainwater, groundwater, river water and flood water in keeping with the local ecological conditions and their water needs.

Answer the following MCQs by choosing the most appropriate options:

- In Western Rajasthan, today plenty of water is available due to:
 - rooftop water harvesting
 - perennial Rajasthan Canal
 - construction of tankas
 - none of the above
- In Rajasthan, rainwater referred to as—

(a) Baarish Pani	(b) Barsat Pani
(c) Badal Pani	(d) Palar Pani

7. Rooftop rainwater is collected using a
- (a) copper pipe (b) aluminium pipe
(c) steel pipe (d) PVC pipe

III. Given the abundance and renewability of water, it is difficult to imagine that we may suffer from water scarcity. The moment we speak of water shortages, we immediately associate it with regions having low rainfall or those that are drought prone. We instantaneously visualise the deserts of Rajasthan and women balancing many 'matkas' (earthen pots) used for collecting and storing water and travelling long distances to get water. True, the availability of water resources varies over space and time, mainly due to the variations in seasonal and annual precipitation, but water scarcity in most cases is caused by over-exploitation, excessive use and unequal access to water among different social groups.

Answer the following MCQs by choosing the most appropriate options:

8. How much Percentage (%) of the Earth's Surface is Covered with water?
- (a) About 70% (b) About 60%
(c) About 90% (d) None of these
9. Based on the information given below, classify each of the situations as 'suffering from water scarcity' or 'not suffering from water scarcity':
- (a) Region with high annual rainfall
(b) Region having high annual rainfall and large population
(c) Region having high annual rainfall but water is highly polluted
(d) Region having low rainfall and low population
10. Why is water scarcity mainly caused:
- (a) water pollution
(b) excessive use and unequal access to water
(c) water management
(d) using to utility
11. According to the given paragraph, which of the following areas would we immediately associated with water scarcity?
- (a) The Ganga plains
(b) Hills of North-Eastern India
(c) Coastal area of Odisha
(d) Deserts of Rajasthan

IV. Most of the objections to the projects arose due to their failure to achieve the purposes for which they were built. Ironically, the dams that were constructed to control floods have triggered floods due to sedimentation in the reservoir. Moreover, the big dams have mostly been unsuccessful in

controlling floods at the time of excessive rainfall. You may have seen or read how the release of water from dams during heavy rains aggravated the flood situation in Maharashtra and Gujarat in 2006. The floods have not only devastated life and property but also caused extensive soil erosion. Sedimentation also meant that the flood plains were deprived of silt, a natural fertiliser, further adding on to the problem of land degradation.

Answer the following MCQs by choosing the most appropriate options:

12. "Multipurpose projects have failed to achieve their purpose for which they were built." Which of the following reason(s) is/are correct about above mentioned statement:
- (a) Dams were constructed to control flood but they have triggered floods due to sedimentation in the reservoir.
(b) Big dams have mostly been unsuccessful in controlling floods at the time of exercise rainfall.
(c) Both (a) and (b)
(d) None of the above
13. Which one of the following is not an adverse effect of dams?
- (a) Interstate water disputes.
(b) Excessive sedimentation of Reservoir
(c) Displacement of population
(d) Flood Control
14. Due to the above given disadvantages and rising resistance against the multi purpose projects, what was considered a viable alternatives?
- (a) Breaking of all dams
(b) Building dams
(c) Construction of tubewells
(d) Rainwater harvesting
- V. Today dams are built not just for irrigation but for electricity generation, water supply for domestic and industrial uses, flood control, recreation, inland navigation and fish breeding. Hence dams are now referred to as multi purpose projects, where the many uses of the impounded water are integrated with one another. For example, in the Sutluj-Beas river basin, the Bhakra-Nangal project water is being used both for hydel power production and irrigation. Similarly, the Hirakud projects, in the Mahanadi basin integrates conservation of water with flood control. Multi purpose projects, launched after Independence with their integrated water resources management approach, were thought of as the vehicle that would lead the nation to

development and progress, overcoming the handicap of its colonial past. Jawaharlal Nehru proudly proclaimed the dams as the 'Temples of Modern India'; the reason being that it would integrate development of agriculture and village economy with rapid industrialisation and growth of the urban economy.

Answer the following MCQs by choosing the most appropriate options:

15. Hirakud dam is built on which river?
 (a) Chenab (b) Mahanadi
 (c) Krishna (d) Satluj
16. Which of the following multipurpose projects is found in the Satluj-Beas river basin?
 (a) Hirakud project
 (b) Damodar Valley Corporation
 (c) Bhakra-Nangal Project
 (d) Rihand Project
17. Why are the dams referred to as multi-purpose projects?

- VI. Read the given source and answer the questions that follow: (2023)

RAINWATER HARVESTING

Many thought that given the disadvantages and rising resistance against the multi purpose projects, water harvesting system was a viable

alternative, both socio-economically and environmentally. In ancient India, along with the sophisticated hydraulic structures, there existed an extraordinary tradition of water harvesting system. People had in-depth knowledge of rainfall regimes and soil types and developed wide ranging techniques to harvest rainwater, groundwater, river water and flood water in keeping with the local ecological conditions and their water needs. In hill and mountainous regions, people built diversion channels like the 'guls' or 'kuls' of the Western Himalayas for agriculture. 'Rooftop rainwater harvesting' was commonly practised to store drinking water, particularly in Rajasthan. In the flood plains of Bengal, people developed inundation channels to irrigate their fields. In arid and semi-arid regions, agricultural fields were converted into rain fed storage structures that allowed the water to stand and moisten the soil like the 'khadins' in Jaisalmer and 'Johads' in other parts of Rajasthan.

18. Why is water harvesting system a viable alternative?
19. Describe the process of 'rooftop rainwater harvesting.'
20. Mention any *two* methods adopted by ancient India for water conservation.



Stand Alone

Multiple Choice Answers

- | | | | | |
|---------|---------|---------|---------|---------|
| 1. (b) | 2. (c) | 3. (b) | 4. (b) | 5. (c) |
| 6. (c) | 7. (d) | 8. (c) | 9. (b) | 10. (a) |
| 11. (d) | 12. (b) | 13. (b) | 14. (d) | 15. (a) |
| 16. (c) | 17. (b) | 18. (a) | 19. (c) | 20. (a) |

Assertion-Reason Answers

- (a) Both assertion and reason are true and reason is the correct explanation of assertion.**
The total volume of world's water is estimated to exist as oceans and only few cent occurs to be fresh water. This fresh water is continually being renewed and recharged through the hydrological cycle. All water moves within the hydrological cycle ensuring that water is a renewable resource.
- (c) Assertion is true but reason is false.**
Water resources varies over space and time due to the variation in seasonal and annual precipitation. However, water scarcity in most cases is caused by over-exploitation and excessive use.
- (a) Both assertion and reason are true and reason is the correct explanation of assertion.**
Dams were traditionally built to impound rivers and rainwater that could be used later to irrigate agricultural fields. But now they also help in various activities. Thus, the reason justifies the assertion.
- (c) Assertion is true but reason is false.**
In Western Rajasthan, the practice of rooftop rainwater harvesting is on decline as plenty of water is available due to the Perennial Indira Gandhi canal.
- (a) Both assertion and reason are true and reason is the correct explanation of assertion.**
Irrigation has also changed the cropping pattern of many regions with farmers shifting to water intensive and commercial crops. Large farmers are benefited through changing the cropping pattern.
- (a) Both assertion and reason are true and reason is the correct explanation of assertion.**
- (a) Both assertion and reason are true and reason is the correct explanation of assertion.**
- (c) Assertion is true but reason is false.**
Water is utilized on large basis because, increasing population requires more water for cooking, washing and bathing. Irrigation is not a major contributor.
- (a) Both assertion and reason are true and reason is the correct explanation of assertion.**

Ground water is a highly overused resource as it is used for domestic purpose and drinking purpose. Huge population mainly depends upon the ground water for basic requirements.

Match the Columns

- (i)-(d)-(4); (ii)-(e)-(6); (iii)-(g)-(5); (iv)-(f)-(2); (v)-(c)-(1); (vi)-(b)-(7); (vii)-(a)-(3)
- (i)-(c); (ii)-(a); (iii)-(d); (iv)-(b)
- (i)-(d); (ii)-(a); (iii)-(b); (iv)-(c)
- (c) 2 1 4 3

Case/Source Based Answers

- | | | | | |
|------|--|---------|---------|--------|
| I. | 1. (c) | 2. (d) | 3. (d) | 4. (b) |
| II. | 5. (b) | 6. (d) | 7. (d) | |
| III. | 8. (a) | | | |
| | 9. Suffering from water scarcity: (b), (c), (d) | | | |
| | Not suffering from water scarcity: (a) | | | |
| | 10. (b) | 11. (d) | | |
| IV. | 12. (c) | 13. (d) | 14. (d) | |
| V. | 15. (b) | 16. (c) | | |
- Today, dams are built not just for irrigation but for electricity generation, water supply for domestic and industrial used, flood control, recreation, inland navigation and fish breeding. Hence, dams are now referred to as multi purpose projects where many uses of the impounded water are integrated with one another.
 - Given the disadvantages and rising resistance against multi-purpose projects, water harvesting system is a viable alternative, both socio-economically and environmentally.
 - Process of Rainwater Harvesting:**
 - Rooftop rainwater is collected using a PVC pipe.
 - Filtered using sand and bricks
 - Underground pipe takes water to sump for immediate usage.
 - Excess water recharges the underground well.
 - Two methods adopted by ancient India for water conservation are:**
 - Guls or Kuls of the western Himalayas for agriculture.
 - 'Khadins' in Jaisalmer and 'Johads' in other parts of Rajasthan.



DO IT YOURSELF...

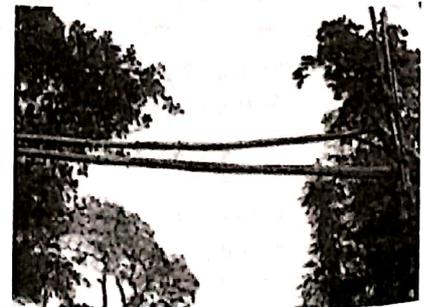
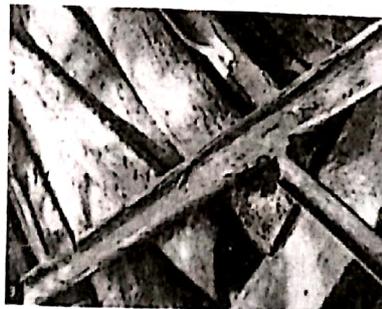
Short Answer Type Questions

- Q.1. What is Palar Pani? 1
- Q.2. On which river is Koyna Dam built? 1
- Q.3. On which river Bhakra Nangal Dam has been constructed? 1
- Q.4. On which river Sardar Sarovar Dam has been built? 1
- Q.5. In which state Hirakud dam is situated? 1
- Q.6. On which river has Nagarjuna Sagar Dam been constructed? 1
- Q.7. Name the state and the river on which the Tehri Dam Project is situated. 1
- Q.8. In which state and across which river the Salal Project is located? 1
- Q.9. Name the largest artificial lake which was built in 11th century. 1
- Q.10. What is the main cause of water scarcity? 1
- Q.11. Rainwater harvesting structures built in Rajasthan are called 1
- Q.12. Name the King (Sultan) who built Hauz Khas in Delhi. 1
- Q.13. Rooftop rainwater harvesting is the most common practice in 1
- Q.14. In which state of India the 'Rooftop rainwater harvesting' structure has been made compulsory with legal provisions? 1
- Q.15. What was the main purpose of starting multi-purpose projects after the independence of India? 2
- Q.16. What are 'Guls' or 'Kuls' ? 2
- Q.17. What are 'Khadins' and 'Johads'? 2
- Q.18. Write a short note on Sardar Sarovar Dam. 2



Long Answer Type Questions

- Q.19. What is rainwater harvesting? Write any **two** methods of Rainwater harvesting popular in different regions of India? 5
- Q.20. How does an abandoned dugwell can be re-filled by the rainwater? 5
- Q.21. (i) Which unique irrigation system is shown in the pictures below? 1
(ii) Where is it most prevalent? 1
(iii) Explain how this system of irrigation functions? 3



- Q.22. Mention **three** major sources of irrigation in India, which source of irrigation is more popular in Southern States and Why? 5