BANNARI AMMAN INSTITUTE OF TECHNOLOGY

(An Autonomous Institution Affiliated to Anna University, Chennai)

SATHYAMANGALAM - 638 401

Discourse Questions

22OAG01 - RAINWATER HARVESTING TECHNIQUES

1. Question

Identify the region that has the lowest average annual precipitation.

a) Tropical rainforests
b) Mediterranean climates
c) Deserts
d) Temperate grasslands

Answer

c) Deserts (1 Mark)

2. Question

As a water resource manager in a drought-prone region, you are asked to present a long-term water management plan to the local government. The region's primary water sources are lakes and groundwater. Based on the figure titled “Global water distribution”, answer the following questions.

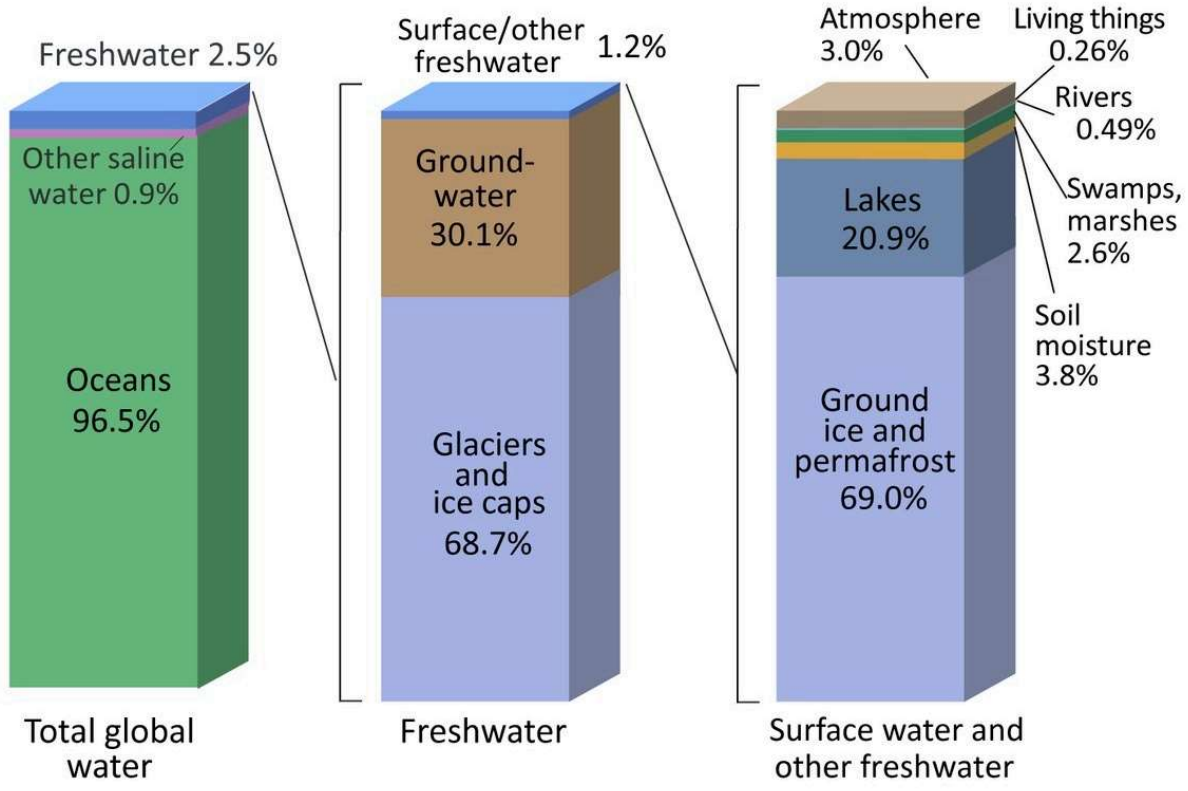

Fig. Global water distribution

a) Assess the availability of freshwater resources in lakes and groundwater.
b) Implement a three-point strategy to ensure sustainable water use in the region, considering the limited global freshwater resources.

Answer

a) Lakes contain 20.9% of the Earth's freshwater (1 Mark)
Groundwater holds 30.1% of the Earth's freshwater (1 Mark)
b) Enhanced Groundwater Recharge (1 Mark)
Lakes Protection (1 Mark)
Water Efficiency Programs (1 Mark)

3. Question

Water distribution systems are complex networks designed to deliver water from a source (such as reservoirs, lakes, rivers, or groundwater) to end-users, including households, industries, and agricultural fields. These systems are crucial for ensuring a reliable supply of clean and safe water.

Among the below mentioned water distribution systems, predict the method that are successfully adopted in Indo-Gangetic plains and give your reason.

a) Warabandi
b) Shejpali
c) Zonal irrigation
d) Localized system

Answer

Warabandi (1 mark)

Rotational method for distribution of irrigation water, with fixed time allocations based on the size of landholdings of individual water users within a water course command area (1 mark)

It presupposes an overall shortage of the water supply (1 mark)

Distribute this restricted supply in an equitable manner over a large command area (1 mark)

4. Question

Identify people living in which of the following regions are most likely to face water scarcity.

a) Areas with high annual rainfall
b) Areas with dense vegetation
c) Arid and semi-arid regions
d) Coastal areas

Answer

c) Arid and semi-arid regions (1 Mark)

5. Question

Identify the factor that contributes most to uneven global water distribution

a) Ocean currents
b) Climate patterns
c) Water pollution
d) Industrial development

Answer

b) Climate patterns (1 Mark)

6. Question

You are an environmental scientist tasked with educating a local community about water conservation. The region depends primarily on river water for its daily needs.

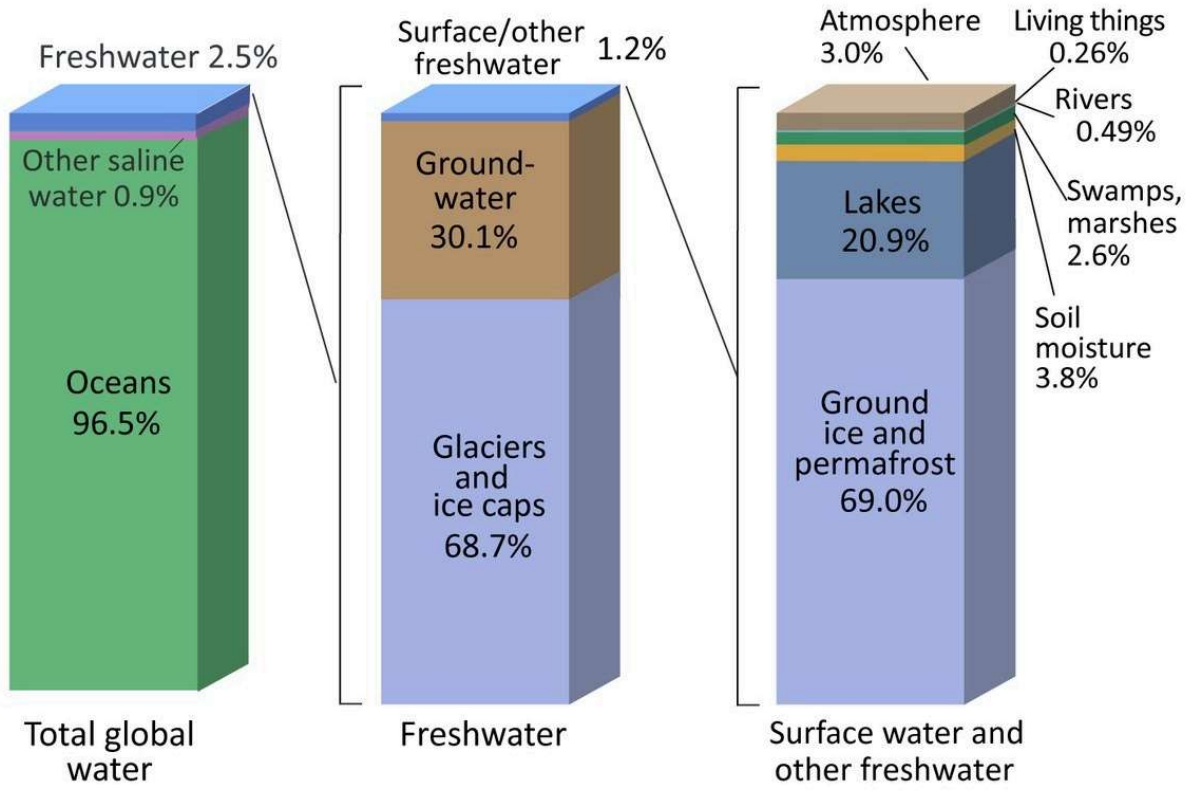

Figure: Global water distribution

Using the data in the figure titled “Global water distribution”, represent to the community why it is crucial to conserve river water and indicate one practical method they can adopt to reduce water wastage.

Answer

0.49% of Earth's freshwater - found in rivers (1 Mark)
Very limited and precious resource (1 Mark)
Practical method adopted - rainwater harvesting (1 Mark)

7. Question

Identify the human activity that can significantly impact the availability of freshwater.
a) Sustainable irrigation practices
b) Water conservation efforts
c) Deforestation
d) Rainwater harvesting

Answer

c) Deforestation (1 Mark)

8. Question

The National Water Policy (NWP) of India has undergone several revisions, with major versions in 1987, 2002, and 2012. As a water resource manager, indicate the differences you witness in National Water Policy 1987 and 2002.

Answer

Including water for ecology purposes (1 Mark)
Prioritizing water needs for development of agro-industries (1 Mark)
Including the participation of private sector (1 Mark)
Involving public participation in water resource management (1 Mark)

9. Question

Identify the factor that complicates water sharing agreements between countries or regions.
a) Availability of advanced water purification technologies
b) Disparities in economic development and water access
c) Lack of interest from international organizations
d) Uniformity in water rights laws

Answer

b) Disparities in economic development and water access (1 Mark)

10. Question

The Cauvery water dispute has been a longstanding issue between the states of Karnataka and Tamil Nadu, primarily revolving around the sharing of river water. The dispute over the sharing of Cauvery River water has been ongoing for decades, primarily because both states depend heavily on this resource. The dispute intensifies during years of low rainfall, leading to conflicts over water allocation.

Outline the factors to be considered in proposing a sustainable water-sharing strategy to resolve this conflict while ensuring that the needs of both states are met equitably.

Answer

Water Availability (1 Mark)
Hydrological Assessment (1 Mark)
Agricultural Demand (1 Mark)
Population and Urban Demand (1 Mark)
Climate Variability and Drought Management (1 Mark)

11. Question

By 2050, the global population is projected to reach 9.7 billion people. This dramatic increase, coupled with rising living standards, has led to a significant surge in water demand for agriculture, industry, and domestic use.
Interpret three major challenges the world faces in managing global water resources.

Answer

Water Scarcity (1 Mark)
Water Pollution (1 Mark)
Unequal Distribution and Access (1 Mark)

12. Question

Identify the main objective of the Pradhan Mantri Krishi Sinchai Yojana (PMKSY)

a) Provide health insurance to farmers
b) Promote agricultural exports
c) Improve irrigation efficiency
d) Supply subsidized seeds

Answer

c) Improve irrigation efficiency (1 Mark)

13. Question

Indicate the use of rainwater harvesting systems in urban areas

a) Increase the risk of flooding due to overloaded drainage systems.
b) Negatively impact the overall water cycle in the environment.
c) Lead to a decrease in water conservation efforts.
d) Reduce pressure on municipal water supplies

Answer

d) Reduce pressure on municipal water supplies

14. Question

Select the principle of water harvesting that emphasizes storing rainwater for future use

a) Flood control
b) Water conservation
c) Maximizing evaporation
d) Soil erosion prevention

Answer

b) Water conservation

15. Question

Assertion (A): Groundwater mapping is an important component of a water resources inventory.
Reason (R): It provides data on rainfall patterns, catchment areas, and water storage capacities

a) Both A and R are true and R is the correct explanation of A
b) Both A and R are true but R is not a correct explanation of A
c) A is true but R is false
d) A is false but R is true

Answer

b) Both A and R are true but R is not a correct explanation of A

16. Question

Select the principle of water harvesting emphasizes storing rainwater for future use

a) Flood control
b) Water conservation
c) Maximizing evaporation
d) Soil erosion prevention

Answer

b) Water conservation

17. Question

You are a city planner tasked with managing the water resources of a rapidly growing urban area. The city is facing frequent water shortages during the dry season, while also experiencing severe flooding during the monsoon. The primary water sources are a river flowing through the city, an aging reservoir, and groundwater wells. Population growth and industrial expansion have increased the demand for water, leading to over-extraction of groundwater and pollution of the river. Local farmers depend on the river and groundwater for irrigation, but urban demands are now in direct conflict with agricultural needs.
Infer the key components of a water resources inventory. Suggest any other system for enhancing water resources.

Answer

Any Four each 1 mark
The key components of a water resources inventory include:

- Water Sources: Identification of surface water bodies (rivers, lakes, reservoirs) and groundwater sources (aquifers, wells).
- Water Quality: Assessment of water quality parameters (e.g., chemical, biological, and physical characteristics).
- Water Usage: Documentation of current water usage and demand across different sectors (residential, industrial, agricultural).
- Infrastructure: Inventory of existing water supply infrastructure (e.g., treatment plants, distribution networks).

Hydrological Data: Collection of data on precipitation, evaporation, and runoff.

18. Question

Identify the primary objective of micro-level water harvesting

a) Recharging groundwater aquifers
b) Collecting rainwater for household use
c) Managing river flow patterns
d) Constructing large dams

Answer

b) Collecting rainwater for household use

19. Question

Analyze how would you implement a rainwater harvesting system for a commercial building with a large roof area.

Answer

For a commercial building with a large roof area, you would: (Any 3, 3 Marks)

Design an Adequate Catchment Area
Select Appropriate Storage.
Install Filtration Systems
Set Up a Distribution System
Plan for Maintenance

20. Question

Indicate the primary goal of water harvesting in rural areas

a) Recharging groundwater aquifers
b) Generating hydroelectric power
c) Creating artificial lakes
d) Enhancing recreational activities

Answer

a) Recharging groundwater aquifers

21. Question

A small village in a semi-arid region faces water scarcity, especially during the dry season. The villagers primarily rely on agriculture for their livelihoods. The village receives an average annual rainfall of 600 mm, mostly during the monsoon season. The community decides to implement a water harvesting system to collect and store rainwater for agricultural and domestic use.

a) Infer the key components of a rural rainwater harvesting system
b) Assess the potential impact of water harvesting on the local ecosystem in a rural area

Answer

a) The key components include a catchment area (such as rooftops or land surfaces).(1 mark)
A conveyance system (gutters and drains), a filtration system, storage tanks or reservoirs. (1 mark)
A distribution system (pumps and pipes). (1 mark)
b) Water harvesting can have several positive impacts on the local ecosystem. (1 mark)
It can reduce soil erosion, enhance groundwater recharge, and provide a more stable water source for wildlife. (1 mark)
However, if not properly managed, it can also lead to reduced downstream flows, affecting aquatic ecosystems and communities that rely on these water sources. (1 mark)

22. Question

A community in a semi-arid region is experiencing water scarcity due to over-reliance on groundwater and insufficient surface water sources. The community decides to implement a rainwater harvesting system to collect and store rainwater for domestic and agricultural use. The system will include rooftop catchment, filtration, storage, and distribution components.
Indicate the key components of a rainwater harvesting system in a semi-arid region?

Answer

(Each 1 mark Any Five)

1) The key components of a rainwater harvesting system include:
2) Catchment area (e.g., rooftops)
3) Conveyance system (e.g., gutters and downspouts)
4) First-flush diverter
5) Filtration system
6) Storage tanks
7) Distribution system (e.g., pumps and pipes)

23. Question

You are part of a team tasked with developing a water resources management plan for a growing metropolitan area. How would you collect and manage data for a water resources inventory?

Answer

To collect and manage data for a water resources inventory, you would:
Conduct Field Surveys: Gather data on water sources, quality, and infrastructure through site visits and inspections.
Utilize Remote Sensing: Employ satellite imagery and GIS technology to map water resources and analyze spatial data. (2 marks)
Collect Hydrological Data: Use instruments and sensors to record precipitation, flow rates, and water levels.
Compile Existing Records: Review and integrate historical data from previous studies, government reports, and utility records.
Create a Database: Organize the collected data into a structured database that allows for easy access, analysis, and updating. (2 marks)

24. Question

In dry climates a common feature of traditional rainwater harvesting systems

a) Large, open-air tanks for easy access.
b) Underground storage to minimize evaporation.
c) Direct use of rainwater without filtration.

d) Limited capacity due to simple construction methods.

Answer

b) Underground storage to minimize evaporation

25. Question

Interpret what differentiates percolation ponds from farm ponds in terms of their role in water harvesting.
a) Percolation ponds are smaller in size
b) Farm ponds are designed mainly for groundwater recharge
c) Percolation ponds focus on enhancing groundwater levels
d) Farm ponds are mainly used for aquaculture

Answer

c) Percolation ponds focus on enhancing groundwater levels

26. Question

Nala bunds are small earthen or masonry structures constructed across seasonal streams, commonly known as "nalas," in rural or hilly regions. They are primarily used for harvesting rainwater, controlling soil erosion, and recharging groundwater. During the implementation of nala bunds, a community faces challenges such as silting, inadequate water storage and maintenance issues. Parse the strategies to address these challenges and to enhance the effectiveness of nala bunds.

Answer

Regular desilting of nala bunds to maintain their storage capacity (1 Mark)
Planting vegetation along the bund to reduce soil erosion and stabilize the structure (1 Mark)
Use of check dams upstream to reduce silt load entering nala bunds (1 Mark)
Incorporating spillways to manage excess water during heavy rainfall, preventing structural damage (1 Mark)

27. Question

Permeable rock dams are also one of the water harvesting structures constructed at the valley bottom. These are used for flood water harvesting, in which runoff water is spread. The water gets stored in the permeable zone of dam.
Outline the suitable areas for the construction of permeable rock dams as rainwater harvesting structure.

Answer

Areas having annual rainfall from 200-750 mm (Semi-arid to Arid areas) (1 Mark)
All agricultural lands (1 Mark)
Areas with slopes below 2.0 % (1 Mark)
Wide and shallow valley beds (1 Mark)

28. Question

Identify which of the following is a primary technique used in micro-level runoff harvesting.
a) Percolation pond
b) Terracing
c) Sprinkler systems
d) Farm pond

Answer

b) Terracing

29. Question

A farmer in a hilly region is facing severe soil erosion during the rainy season, which is affecting his crop yield. He wants to implement a technique that can control soil erosion and conserve water effectively.
Predict which micro-level runoff harvesting technique should he choose and give your comment.

Answer

Terracing (1 Mark)
Terracing involves creating step-like structures on the slope, which slows down the flow of water (1 Mark)
Reduces soil erosion and allows water to infiltrate into the ground (1 Mark)

30. Question

A rural community is facing a shortage of water due to low groundwater levels. They want to use a runoff harvesting technique to improve groundwater recharge on relatively flat land.
a) Assess which micro-level runoff harvesting technique would be most appropriate and give your comment.
b) Predict the major factors that should be considered while implementing the selected runoff harvesting technique in the community.

Answer

a) Bunding (1 Mark)
Bunding involves creating embankments along the contours of the land to capture runoff water (1 Mark)
It traps water, allowing it to slowly percolate into the soil, thus enhancing groundwater recharge (1 Mark)
b) Soil Type (1 Mark)
Topography (1 Mark)

31. Question

Identify the primary factor influencing the effectiveness of nala bunds.
a) The amount of water stored
b) Soil type and porosity
c) Proximity to agricultural land
d) Depth of the water stored

Answer

b) Soil type and porosity

32. Question

Identify which of the maintenance activity is commonly required for nala bunds.
a) Regular painting
b) Removal of silt and debris to maintain capacity
c) Relining with plastic sheets
d) Replanting trees around the bund

Answer

b) Removal of silt and debris to maintain capacity

33. Question

Identify which of the following is a primary technique used in micro-level runoff harvesting.
a) Percolation pond
b) Terracing
c) Sprinkler systems
d) Farm pond

Answer

b) Terracing

34. Question

Contour bunds as water harvesting structure and also for tree planting are simplified form of micro catchments. The construction of bunds can be easily done by machines; due to this reason this method of water harvesting is found suitable for larger area. Outline the suitable areas for the construction of contour bunds as rainwater harvesting structure.

Answer

Areas having annual rainfall from 200-750 mm (Semi-arid to Arid areas) (1 Mark)
Soils with depth of preferably upto 2 m (1 Mark)
Areas with slopes ranging from flat to 5.0 % (1 Mark)
Even topography without gullies or rills (1 Mark)

35. Question

Identify which factor primarily influences the selection of runoff coefficients.
a) Soil type
b) Solar radiation
c) Population density
d) Elevation

Answer

a) Soil type

36. Question

A farm is experiencing rapid rainfall events leading to potential flash floods. A rainwater harvesting system is proposed to manage runoff and reduce peak flow.

Compute how would hydrograph analysis help in the design of this rainwater harvesting system and assess what parameters would be key to reducing flood risks.

Answer

Hydrograph analysis provides insights into how water runoff varies over time during and after rainfall (1 Mark)

Use the hydrograph to identify peak flows and design storage structures to capture and slowly release runoff to prevent flash floods (1 Mark)

Key Parameters: Peak discharge (1 Mark)

Total runoff volume (1 Mark)

37. Question

Identify the human activity that contributes to the exacerbation of urban floods.

a) Energy conservation efforts
b) Reforestation projects
c) Industrialization and urban sprawl
d) Implementation of green building codes

Answer

c) Industrialization and urban sprawl

38. Question

A semi-arid agricultural region experiences seasonal flash floods during the monsoon season, followed by long dry spells. The government is planning to implement water spreading bunds on agricultural lands and construct a flood control reservoir downstream to manage the flash floods and store water for irrigation during the dry season.

Agree /Disagree the statements with respect to water spreading statements

a) Water spreading bunds are used to prevent soil erosion in hilly areas
b) Water spreading bunds can only be used in flat terrains.
c) The primary function of water spreading bunds is to improve agricultural yield.
d) Water spreading bunds are constructed perpendicular to the slope of the land.
e) Water spreading bunds do not contribute to flood prevention.

Answer

Each One mark

a) Agree
b) Disagree
c) Agree
d) Agree
e) Disagree

39. Question

A large river basin is prone to flooding during the rainy season, leading to the destruction of crops and settlements. To address the problem, water spreading bunds are constructed along tributaries in the upper basin, and a flood control reservoir is built downstream, near a major town.

a) Does water spreading bund can protect the town? Justify

b) Whether upper basin and a flood control reservoir downstream can manage floodwaters?

Answer

a) Yes , the bunds prevent minor flooding in the upper basin and reduce the pressure on the river downstream (1 mark)
By enhancing infiltration, the bunds contribute to groundwater recharge, which also supports local agriculture and water supply during the dry season. (1 mark)

b) Yes, the bunds constructed along the tributaries in the upper basin help intercept and spread floodwaters during heavy rains, reducing the speed and volume of water flowing downstream. (1 mark)

The flood control reservoir, built downstream near the town, serves as the final defense against large floods. It captures excess water that escapes from the upper basin, preventing the town from being flooded. (1 mark)

40. Question

A large river basin is prone to seasonal flooding, impacting nearby towns and agricultural lands. To address this issue, a flood control reservoir is constructed upstream. The reservoir is designed to capture excess water during heavy rainfall, gradually releasing it downstream to prevent flash floods. Local authorities are optimistic that the reservoir will significantly reduce the flood risks in the area.

Based on the scenario, Analyze whether the given statement is true/False

a) The flood control reservoir will immediately stop all flooding in the river basin, regardless of the intensity of rainfall.
b) Agricultural lands near the river will experience more frequent flooding due to the reservoir's presence.
c) Even in dry seasons, the flood control reservoir can provide a consistent water supply for irrigation or other needs

Answer

a) False
b) False
c) True

41. Question

In a small rural community prone to seasonal flooding, local farmers have noticed that heavy rains lead to soil erosion and loss of crops. To address this issue, the village has decided to build permeable rock dams in strategic locations along small streams and rivers. These dams allow water to pass through slowly, reducing the speed of water flow, and help to filter out sediment and debris. The goal is to control flooding, recharge groundwater, and improve agricultural productivity.

a) Interpret a technique to reduce soil erosion in permeable rock dams
b) Infer the material that are used to construct a permeable rock dam

Answer

a) By slowing down the water flow, permeable rock dams reduce the impact of fast-moving water, which can erode soil from riverbanks and fields.(1 mark)
The slower water is less likely to carry away large amounts of soil, preserving the land around the dam .(1 mark)
b) Permeable rock dams are typically constructed using large rocks or boulders.(1 mark)
Sometimes smaller stones or gravel are added between the larger rocks to increase filtration. The material used should be strong and durable to withstand water pressure while still allowing water to flow through. .(1 mark)

42. Question

Indicate the primary objective of flood water harvesting.

a) Preventing soil erosion
b) Enhancing groundwater recharge
c) Increasing air pollution
d) Reducing noise levels

Answer

b) Enhancing groundwater recharge

43. Question

Indicate the goal of flood water harvesting systems.

a) Preventing soil erosion
b) Storing excess floodwater for beneficial use
c) Increasing air pollution
d) Promoting urban sprawl

Answer

b) Storing excess floodwater for beneficial use

44. Question

Recall the weather phenomenon which is often associated with flash floods in urban areas.

a) Snowstorms
b) Thunderstorms
c) Heatwaves
d) Tornadoes

Answer

b) Thunderstorms

45. Question

In a small rural community prone to seasonal flooding, local farmers have noticed that heavy rains lead to soil erosion and loss of crops. To address this issue, the village has decided to build permeable rock dams in strategic locations along small streams and rivers. These dams allow water to pass through slowly, reducing the speed of water flow, and help to filter out sediment and debris. The goal is to control flooding, recharge groundwater, and improve agricultural productivity.
Identify the ecological benefits that can be provided by permeable rock dams besides flood control

Answer

(Each 1 mark)
Permeable rock dams can enhance local ecosystems
By creating wetland-like environments upstream, which support biodiversity.
They also promote groundwater recharge, which can benefit plant life,
Provide habitats for fish and other aquatic organisms by maintaining a stable water flow.

46. Question

Identify the primary consideration in selecting the location for flood water harvesting systems.

a) Number of fast-food restaurants
b) Proximity to historical landmarks
c) Topography and drainage patterns
d) Population growth rate

Answer

c) Topography and drainage patterns

47. Question

Indicate the characteristic which is typical of water spread during urban floods.

a) Uniform distribution
b) Rapid retreat
c) Limited area coverage
d) Slow accumulation

Answer

b) Rapid retreat

48. Question

A coastal city is facing increasing challenges with water management due to frequent rainfall and occasional storm surges. To prevent flooding, the local government has decided to implement trenching and diversion structures as part of its flood mitigation strategy. The goal is to manage water runoff effectively by creating pathways for excess water to flow away from residential areas, roads, and agricultural lands. The city's civil engineering team is tasked with designing and constructing these systems while ensuring minimal environmental disruption.

a) Indicate the areas in which trenching and diversion structures are used effectively.
b) Can trenching and diversion structures be used in agricultural settings? Justify

Answer

a) Trenching and diversion structures systems are most effective in areas prone to heavy rainfall, flash flooding, or coastal storm surges. (1 mark)
They are particularly useful in regions with uneven terrain, where water naturally flows toward low-lying areas, or in urban areas where impermeable surfaces, like roads and buildings, can exacerbate runoff. (1 mark)
b) Yes, trenching and diversion structures are highly effective in agriculture. (1 mark)
They can prevent fields from becoming waterlogged by diverting excess rainwater away from crops. (1 mark)

49. Question

In a rural community with a history of water scarcity, a project team is constructing a series of recharge pits to help replenish the groundwater levels. The team is working in an area with predominantly clayey soil, known for its poor drainage properties. During the initial excavation, they observe that the clay soil is compact and does not allow water to percolate effectively, leading to concerns that the recharge pit will not function as intended.
Outline the modifications that you would suggest to enhance the percolation rate and effectiveness of the recharge pit in clayey soil conditions.

Answer

Excavate Deeper (1 mark)
Add Coarse Sand and Gravel Layers (1 mark)
Create Trenches and Lateral Drains (1 mark)
Use Geotextile Fabric (1 mark)
Add Organic Material and Permeable Fill (1 mark)

50. Question

A commercial office building in an urban area installed a rooftop rainwater harvesting system a year ago. Recently, the building management noticed that the water stored in the tank has a foul smell and appears murky. They use this water for landscaping and cleaning purposes, but the poor water quality is causing complaints from the maintenance team.
Based on the above scenario, analyze the potential causes for the poor quality of water and parse the methods to rectify them.

Answer

Potential Causes:
Improper Gutter Maintenance (1 mark)
Faulty First-Flush Diverter (1 mark)
Inadequate Filtration (1 mark)
Rectifications:
Regularly clean and maintain gutter (1 mark)
Inspect and repair or replace the first-flush diverter (1 mark)
Upgrade or clean the filtration system to ensure water quality (1 mark)

51. Question

A rural community with an annual rainfall of 800 mm has adopted rooftop rainwater harvesting for groundwater recharge using tubewells.
Infer two potential socio-economic outcomes for the community after five years of successful implementation of this system.

Answer

Improved water security (1 mark)
Community resilience / Cost savings (1 mark)

52. Question

Represent the primary factor that influences the efficiency of a recharge trench.

a) Trench width
b) Roof color
c) Height of the building
d) Flooring material

Answer

a) Trench width

53. Question

Identify the primary objective of rooftop rainwater harvesting.

a) Reducing groundwater depletion
b) Increasing soil erosion
c) Encouraging surface runoff
d) Enhancing water pollution

Answer

a) Reducing groundwater depletion

54. Question

Indicate the structure that is designed to channel rainwater directly into underground aquifers.

a) Recharge shaft
b) Dug well
c) Percolation tank

d) Nala bund

Answer

d) Nala bund

55. Question

Identify the main aim of artificial recharge of groundwater.

a) Increase soil erosion
b) Decrease groundwater levels
c) Enhance groundwater storage
d) Reduce surface runoff

Answer

c) Enhance groundwater storage

56. Question

In a semi-urban area with rapidly depleting groundwater levels, a homeowner decides to install a rooftop rainwater harvesting system connected to a tubewell.
Assess how this system can help in improving the groundwater levels and water availability in the long term.

Answer

Increases the percolation of water into the aquifer (1 mark)
Replenishes groundwater reserves (1 mark)
Mitigate the depletion of groundwater levels and improve water availability (1 mark)

57. Question

A residential community decides to implement rooftop rainwater harvesting. They collect water from rooftops and direct it to a recharge pit. To further enhance groundwater recharge, they also build gully plugs on a slope nearby.
Illustrate how the combination of rooftop rainwater harvesting and gully plugs can maximize the groundwater recharge potential in this area.

Answer

Combination of rooftop rainwater harvesting and gully plugs maximizes groundwater recharge by capturing rainwater from two sources (1 mark)
Rooftop system collects and channels water to a recharge pit, which infiltrates directly into the ground (1 mark)
Gully plugs, constructed across natural water channels on the slope, slow down the surface runoff, allowing water to percolate into the soil (1 mark)
Dual approach increases the amount of water reaching the aquifers, effectively enhancing the overall recharge potential (1 mark)

58. Question

Identify the primary use of a percolation tank in water management.

a) Storing industrial waste
b) Treating sewage
c) Recharging groundwater
d) Diverting river flow

Answer

c) Recharging groundwater

59. Question

In water management, infer what does the term 'artificial recharge' refer to.

a) Pumping water from aquifers
b) Redirecting river flow
c) Injecting water into aquifers
d) Treating wastewater

Answer

c) Injecting water into aquifers

60. Question

A community center with a rooftop rainwater harvesting system and percolation tank has experienced a significant reduction in water percolation efficiency after five years of operation.
Identify the two potential technical reasons for the reduced efficiency and propose corrective measures to restore the system's recharge capacity.

Answer

- Clogging of the percolation tank due to sediment buildup (1 mark)
- Can be resolved by desilting and cleaning the tank (1 mark)
- Another reason might be compaction of soil around the tank (1 mark)
- Could be improved by aerating or loosening the soil to enhance water infiltration (1 mark)