Arizona State University (ASU) GLG108 Water Planet Midterm 2 Practice Exam (Sample)

Study Guide

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Questions

1. What is a key factor affecting water discharge according to Darcy's Law?
   A. Temperature of the water
   B. Diameter of the pipe
   C. Type of water
   D. Amount of sediment in the water

2. What is the primary goal of integrated water resource management (IWRM)?
   A. Maximize economic benefits at any cost
   B. Encourage total privatization of water resources
   C. Promote coordinated development without harming sustainability
   D. Minimize government involvement in water management

3. What is a common use for greywater, excluding its typical disposal?
   A. Irrigation
   B. Drinking
   C. Industrial processes
   D. Filling swimming pools

4. What is a key impact of excess nitrogen in ecosystems?
   A. Increased biodiversity
   B. Decreased soil fertility
   C. Eutrophication in water bodies
   D. Heightened carbon capture

5. What does 'salinization' refer to in the context of water resources?
   A. The process of cleaning water for reuse
   B. The accumulation of salts in soil and water
   C. The removal of nutrients from water
   D. The acidification of water bodies

6. Which law is significant for regulating water quality in the United States?

A. Safe Drinking Water Act

B. Clean Water Act

C. Water Pollution Control Act

D. Water Quality Improvement Act

7. What does the term "Natural Capital" refer to?

A. Economic value of urban infrastructure

B. Natural services and resources

C. Technological advancements in conservation

D. Human-made resources for sustainability

8. What are the implications of over-extraction of groundwater?

A. Increased water quality

B. Depletion of aquifers

C. Elevation of land

D. Improved soil health

9. Which country was a leader in dam construction during the 1800s and 1900s?

A. Germany

B. United Kingdom

C. United States

D. Canada

10. What is a characteristic of total maximum daily loads (TMDLs)?

A. They only apply to drinking water sources

B. They are specific to each individual pollutant

C. They set limits on water volume rather than pollutants

D. They do not consider aquatic life health

Answers

1. B
2. C
3. A
4. C
5. B
6. B
7. B
8. B
9. C
10. B

Explanations

1. What is a key factor affecting water discharge according to Darcy's Law?

A. Temperature of the water

B. Diameter of the pipe

C. Type of water

D. Amount of sediment in the water

The key factor affecting water discharge according to Darcy's Law is the diameter of the pipe. Darcy's Law describes the flow of a fluid through a porous medium, and one of the central components of this law is the cross-sectional area through which the fluid is flowing. The diameter of the pipe directly influences this cross-sectional area; a wider pipe allows for greater volume and speed of water flow compared to a narrower pipe since it can accommodate a larger quantity of water moving through it at once. This principle underlines the relationship between hydraulic conductivity, pressure gradient, and the area of flow. Understanding how the diameter of a pipe affects discharge helps in applications ranging from civil engineering to groundwater management, emphasizing the importance of pipe size in designing effective fluid transport systems.

2. What is the primary goal of integrated water resource management (IWRM)?

A. Maximize economic benefits at any cost

B. Encourage total privatization of water resources

C. Promote coordinated development without harming sustainability

D. Minimize government involvement in water management

The primary goal of integrated water resource management (IWRM) is to promote coordinated development and management of water, land, and related resources in a way that maximizes economic and social welfare without compromising the sustainability of vital ecosystems. This approach recognizes that water is a finite resource that must be managed in a holistic and inclusive manner, considering not only human needs but also environmental health. IWRM aims to balance these various needs through collaboration among stakeholders, including government agencies, local communities, and the private sector, helping to ensure that water resources are used efficiently and sustainably. By focusing on holistic management rather than prioritizing short-term gains, IWRM addresses challenges such as water scarcity, pollution, and the impacts of climate change. This goal stands in contrast to other approaches that may prioritize economic benefits at the expense of environmental integrity or advocate for the privatization of water resources, which can lead to unequal access and social injustices. Additionally, minimizing government involvement can undermine effective management and regulation of water resources, which is critical for achieving sustainability. Through IWRM, the focus is on long-term health and balance within water systems.

3. What is a common use for greywater, excluding its typical disposal?

A. Irrigation

B. Drinking

C. Industrial processes

D. Filling swimming pools

Greywater refers to the relatively clean wastewater generated from activities such as washing dishes, laundry, and bathing. One of the most common uses for greywater is irrigation. This is because greywater often contains nutrients that can benefit plants, making it a resourceful option for watering gardens and landscaping. Utilizing greywater for irrigation helps conserve fresh water, reduces the demand on water supply systems, and promotes environmental sustainability. Many regions that experience water scarcity implement greywater recycling systems specifically for this purpose, highlighting its practicality and benefits in managing water resources effectively. Other options, while they may have specific contexts in which they might apply, do not align as closely with common or practical uses for greywater.

4. What is a key impact of excess nitrogen in ecosystems?

A. Increased biodiversity

B. Decreased soil fertility

C. Eutrophication in water bodies

D. Heightened carbon capture

Excess nitrogen in ecosystems primarily leads to eutrophication in water bodies. When nitrogen from fertilizers, sewage, or other sources enters aquatic environments, it acts as a nutrient that stimulates excessive growth of algae, known as algal blooms. These blooms can significantly deplete oxygen levels in the water as they die and decompose, leading to hypoxic conditions that are harmful to aquatic life. This process disrupts the balance of the ecosystem, resulting in reduced biodiversity, fish kills, and changes in species composition. In contrast, while increased biodiversity and heightened carbon capture may appear beneficial, they are generally not direct outcomes of excess nitrogen. Decreased soil fertility is also misleading in this context; instead, excess nitrogen can initially enhance soil fertility but ultimately contribute to environmental degradation. Therefore, the most accurate and significant impact of excess nitrogen in ecosystems is the process of eutrophication.

5. What does 'salinization' refer to in the context of water resources?

A. The process of cleaning water for reuse

B. The accumulation of salts in soil and water

C. The removal of nutrients from water

D. The acidification of water bodies

Salinization refers specifically to the accumulation of salts in soil and water. This process can occur naturally through the weathering of rocks and minerals, but it is often exacerbated by human activities, such as irrigation and land development. When water evaporates from soil or surfaces, it can leave behind dissolved salts, which can build up over time, affecting soil fertility and water quality. This phenomenon is particularly problematic in arid and semi-arid regions where water evaporation rates are high, leading to increased salinity. Understanding salinization is crucial because it can have significant impacts on agricultural productivity and ecosystems.

6. Which law is significant for regulating water quality in the United States?

A. Safe Drinking Water Act

B. Clean Water Act

C. Water Pollution Control Act

D. Water Quality Improvement Act

The Clean Water Act is significant for regulating water quality in the United States because it establishes the framework for regulating the discharge of pollutants into the waters of the nation and regulating quality standards for surface waters. Enacted in 1972, it aims to restore and maintain the integrity of the nation's waters by prohibiting the discharge of pollutants without a permit and setting water quality standards to protect aquatic ecosystems and public health. This act is crucial because it provides a foundation for states to implement their own water quality standards and management practices. It also emphasizes the importance of protecting wetlands and promotes the use of technologies and practices to reduce water pollution. Through this legislation, the federal government can take measures to address water quality issues on a national scale, ensuring safe and clean water resources are available for all. Other acts mentioned, while important, focus on different aspects of water safety and pollution control. For example, the Safe Drinking Water Act primarily addresses the safety of drinking water supplies, while the Water Quality Improvement Act and the Water Pollution Control Act are more limited in their scope and enforcement mechanisms compared to the Clean Water Act.

7. What does the term "Natural Capital" refer to?

A. Economic value of urban infrastructure

B. Natural services and resources

C. Technological advancements in conservation

D. Human-made resources for sustainability

Natural Capital refers to the world's stocks of natural assets, which include geology, soil, air, water, and all living things. It emphasizes the essential services and resources that nature provides, such as clean water, fertile soil for agriculture, and the carbon-sequestering abilities of forests. These natural resources contribute to human well-being and economic activities; thus, understanding their value is crucial for sustainable development and environmental management. This concept is vital in environmental economics, where the sustainability of ecosystems and biodiversity is considered in making decisions about resource use and conservation. Recognizing the intrinsic value of these natural services helps inform policies and practices aimed at protecting the environment while ensuring that it can continue to support human life and economic activities.

8. What are the implications of over-extraction of groundwater?

A. Increased water quality

B. Depletion of aquifers

C. Elevation of land

D. Improved soil health

Over-extraction of groundwater, which refers to the removal of water from aquifers at a rate faster than it can be replenished, leads to the depletion of those aquifers. This is a significant concern in many regions where groundwater serves as a primary source of water for drinking, irrigation, and industrial use. As aquifers are drained more rapidly than they can recharge naturally through precipitation or surface water infiltration, water levels drop, leading to several consequences. Depleted aquifers can result in reduced water availability, which can affect agriculture, drinking water supplies, and ecosystem sustainability. Additionally, the lowering of groundwater levels can cause land subsidence—where the ground sinks as underground water is removed—leading to structural damage to buildings and roads. Furthermore, as aquifers become depleted, there may be increased salinity in coastal areas due to saltwater intrusion, which can further compromise water quality. In contrast, the other options—improved water quality, elevation of land, and improved soil health—do not typically result from over-extraction. Instead, they might represent conditions that could be improved by careful water management, which is the opposite of what occurs with excessive pumping of groundwater resources.

9. Which country was a leader in dam construction during the 1800s and 1900s?

A. Germany

B. United Kingdom

C. United States

D. Canada

The United States played a significant role in dam construction during the 1800s and 1900s, primarily due to its expanding industrial base and increasing need for water management to support agriculture, electricity generation, and flood control. This era saw the construction of iconic dams like the Hoover Dam, which became a symbol of modern engineering and the government's commitment to large-scale infrastructure projects. The U.S. government's involvement, particularly through agencies like the Bureau of Reclamation, facilitated the development of numerous dams across the country, reflecting the nation's focus on harnessing natural resources for economic growth. Additionally, the construction of these dams represented a shift in water management practices, prioritizing not only irrigation but also recreation and hydropower, showcasing the multifaceted benefits of such infrastructure. Other countries had their own contributions to dam construction, but the scale and scope of U.S. projects during this time were particularly notable, making it a leader in the field. The significance of this infrastructure continues to impact water management policies and practices today.

10. What is a characteristic of total maximum daily loads (TMDLs)?

A. They only apply to drinking water sources

B. They are specific to each individual pollutant

C. They set limits on water volume rather than pollutants

D. They do not consider aquatic life health

Total Maximum Daily Loads (TMDLs) are crucial regulatory tools in water quality management that focus on establishing the maximum amount of a particular pollutant that can be introduced into a water body while still meeting water quality standards. This characteristic underscores the need for specificity in pollution control efforts, as different pollutants can have varying impacts on ecosystems and water quality. By being specific to each individual pollutant, TMDLs help identify how much of that pollutant can be present while protecting the designated uses of the water body, such as supporting aquatic life, recreational activities, and drinking water sources. This targeted approach allows for more effective pollution management strategies that can address the unique challenges associated with different pollutants, such as nutrients, heavy metals, or pathogens. In contrast, TMDLs do not apply only to drinking water sources; they are relevant to all water bodies that require pollutant management. They also focus on pollutant limits rather than water volume and take into account the health of aquatic life by ensuring that the water quality standards necessary for sustaining ecosystems are met.