

Principles and Practice of Engineering (PE) Civil: Water Resources and Environmental (WRE) Practice Exam (Sample)

Study Guide



Everything you need from our exam experts!

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Introduction

Preparing for a certification exam can feel overwhelming, but with the right tools, it becomes an opportunity to build confidence, sharpen your skills, and move one step closer to your goals. At Examzify, we believe that effective exam preparation isn't just about memorization, it's about understanding the material, identifying knowledge gaps, and building the test-taking strategies that lead to success.

This guide was designed to help you do exactly that.

Whether you're preparing for a licensing exam, professional certification, or entry-level qualification, this book offers structured practice to reinforce key concepts. You'll find a wide range of multiple-choice questions, each followed by clear explanations to help you understand not just the right answer, but why it's correct.

The content in this guide is based on real-world exam objectives and aligned with the types of questions and topics commonly found on official tests. It's ideal for learners who want to:

- Practice answering questions under realistic conditions,
- Improve accuracy and speed,
- Review explanations to strengthen weak areas, and
- Approach the exam with greater confidence.

We recommend using this book not as a stand-alone study tool, but alongside other resources like flashcards, textbooks, or hands-on training. For best results, we recommend working through each question, reflecting on the explanation provided, and revisiting the topics that challenge you most.

Remember: successful test preparation isn't about getting every question right the first time, it's about learning from your mistakes and improving over time. Stay focused, trust the process, and know that every page you turn brings you closer to success.

Let's begin.

How to Use This Guide

This guide is designed to help you study more effectively and approach your exam with confidence. Whether you're reviewing for the first time or doing a final refresh, here's how to get the most out of your Examzify study guide:

1. Start with a Diagnostic Review

Skim through the questions to get a sense of what you know and what you need to focus on. Your goal is to identify knowledge gaps early.

2. Study in Short, Focused Sessions

Break your study time into manageable blocks (e.g. 30 - 45 minutes). Review a handful of questions, reflect on the explanations.

3. Learn from the Explanations

After answering a question, always read the explanation, even if you got it right. It reinforces key points, corrects misunderstandings, and teaches subtle distinctions between similar answers.

4. Track Your Progress

Use bookmarks or notes (if reading digitally) to mark difficult questions. Revisit these regularly and track improvements over time.

5. Simulate the Real Exam

Once you're comfortable, try taking a full set of questions without pausing. Set a timer and simulate test-day conditions to build confidence and time management skills.

6. Repeat and Review

Don't just study once, repetition builds retention. Re-attempt questions after a few days and revisit explanations to reinforce learning. Pair this guide with other Examzify tools like flashcards, and digital practice tests to strengthen your preparation across formats.

There's no single right way to study, but consistent, thoughtful effort always wins. Use this guide flexibly, adapt the tips above to fit your pace and learning style. You've got this!

Questions

- 1. Which one of the following is not an assumption for defining the discharge rate of radial flow in a confined aquifer?**
 - A. Three-dimensional flow**
 - B. Steady-state flow**
 - C. Radial symmetry**
 - D. Homogeneous material**
- 2. What is the final step in designing a culvert?**
 - A. Calculate the diameter**
 - B. Name the culvert**
 - C. Calculate headwater depth**
 - D. Calculate exit velocity**
- 3. What does the Silt Density Index indicate about membrane performance?**
 - A. The overall water quality**
 - B. The potential for nutrient contamination**
 - C. The extent of membrane fouling**
 - D. The required maintenance frequency**
- 4. Which of the following is the primary function of a primary clarifier in wastewater treatment?**
 - A. Remove odor**
 - B. Remove solids**
 - C. Remove grease**
 - D. Remove nutrients**
- 5. Which of the following plans is similar to a SWPPP as required by the EPA NPDES permit?**
 - A. Water Quality Management Plan**
 - B. Erosion Control Plan**
 - C. Construction Site Best Management Practices Plan**
 - D. Site Soil Conservation Plan**

- 6. If the hydraulic radius for full flow condition is calculated as $D/4$, what does this refer to?**
- A. Half the diameter**
 - B. One-fourth of the diameter**
 - C. Flow area divided by flow perimeter**
 - D. The critical depth of flow**
- 7. What effect does an increase in the F:M ratio have in wastewater treatment?**
- A. Pursuance of sludge removal**
 - B. Decrease in MLSS**
 - C. Promotion of biological growth**
 - D. Reduction in SVI**
- 8. Which parameters would likely be limited in a discharge permit to prevent eutrophication?**
- A. BOD₅, total iron**
 - B. SS, ammonia**
 - C. BOD₅, Total N, Total P**
 - D. pH, total ammonia**
- 9. What fundamental principle governs fluid motion and is applicable in flow calculation?**
- A. Conservation of momentum**
 - B. Conservation of mass**
 - C. Bernoulli's principle**
 - D. Hydraulic conductivity**
- 10. What causes elastic settlement of the ground due to a surface load?**
- A. Deformation of soil with a change in water content**
 - B. Deformation of soil without a change in its water content**
 - C. Increase in groundwater levels**
 - D. Soil consolidation from overburden pressure**

Answers

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

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Explanations

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1. Which one of the following is not an assumption for defining the discharge rate of radial flow in a confined aquifer?

A. Three-dimensional flow

B. Steady-state flow

C. Radial symmetry

D. Homogeneous material

The correct response relates to the movement of groundwater in a confined aquifer, particularly regarding the assumptions made during the analysis of radial flow. In radial flow scenarios, certain conditions are typically assumed to simplify the modeling of groundwater movement. Steady-state flow, radial symmetry, and homogeneous material are critical assumptions for analyzing discharge in confined aquifers. Steady-state flow means the hydraulic conditions do not change over time, allowing for the use of consistent hydraulic parameters. Radial symmetry implies that the flow is uniform in all directions from the well, which is crucial for simplifying the mathematical representation of the flow. Homogeneous material assumes that the aquifer's properties, such as permeability, are consistent throughout, which is necessary for accurate modeling and prediction of how water will move through the aquifer. On the other hand, three-dimensional flow is not an assumption typically associated with radial flow in confined aquifers. Instead, radial flow is often modeled as a two-dimensional problem due to the inherent symmetry of the situation; the flow can be expressed as occurring in a plane around the well. Therefore, the notion of three-dimensional flow becomes unnecessary and overly complex for the purposes of defining discharge rates in this context. This makes it the correct choice for the question regarding assumptions.

2. What is the final step in designing a culvert?

A. Calculate the diameter

B. Name the culvert

C. Calculate headwater depth

D. Calculate exit velocity

The final step in designing a culvert typically involves calculating exit velocity. This calculation is crucial for ensuring that the culvert functions effectively in controlling water flow and preventing erosion at the outlet. By determining the exit velocity, engineers can assess the potential for downstream impacts, including scouring or damage to the surrounding environment. In the design process, prior tasks such as calculating diameter and headwater depth are essential for establishing the culvert's size and its capacity to handle anticipated flow conditions. However, these are not the concluding steps, as understanding how the water will exit the culvert and affect the surrounding area is critical for finalizing the design. Naming the culvert, while an administrative task, is not part of the design functionality and doesn't impact its hydraulic performance. Thus, focusing on exit velocity allows engineers to comprehensively assess the system's overall performance and environmental impact.

3. What does the Silt Density Index indicate about membrane performance?

- A. The overall water quality**
- B. The potential for nutrient contamination**
- C. The extent of membrane fouling**
- D. The required maintenance frequency**

The Silt Density Index (SDI) is a key metric used to assess the fouling potential of water on membranes, particularly in water treatment processes. It specifically measures the amount of silt in the water that can lead to clogging or blocking of the membrane pores. A higher SDI value indicates a greater concentration of suspended solids, which correlates with increased fouling potential. Monitoring the SDI helps in anticipating how membrane systems will perform over time, specifically regarding their susceptibility to fouling. Thus, when the SDI indicates higher values, it signifies that there is likely to be more significant fouling occurring, which could negatively impact the efficiency and lifespan of the membrane. Therefore, recognizing the SDI allows operators to adjust pre-treatment methods appropriately and manage the operational strategies of the membrane system to mitigate fouling issues.

4. Which of the following is the primary function of a primary clarifier in wastewater treatment?

- A. Remove odor**
- B. Remove solids**
- C. Remove grease**
- D. Remove nutrients**

The primary function of a primary clarifier in wastewater treatment is to remove solids from the wastewater. During the treatment process, the primary clarifier plays a crucial role in separating suspended solids from liquid waste. As wastewater enters the clarifier, it allows for sedimentation, where heavier solids settle to the bottom, forming what is known as primary sludge. This process not only reduces the amount of solid material in the water but also helps to clarify the effluent that is discharged from the clarifier. While other processes in wastewater treatment may address odor, grease, or nutrients, the clarifier's primary purpose is focused on the removal of suspended and settleable solids. This is essential for reducing the load on subsequent treatment processes, such as biological treatment, and is a fundamental step in ensuring water quality in the overall treatment system.

5. Which of the following plans is similar to a SWPPP as required by the EPA NPDES permit?

A. Water Quality Management Plan

B. Erosion Control Plan

C. Construction Site Best Management Practices Plan

D. Site Soil Conservation Plan

A Construction Site Best Management Practices Plan (BMP) is designed specifically to reduce the impact of construction activities on the surrounding environment, particularly in managing stormwater runoff. The plan aligns closely with the requirements of a Stormwater Pollution Prevention Plan (SWPPP) under the NPDES permit system, as both aim to prevent water pollution and manage erosion, sedimentation, and other environmental concerns during construction activities. The SWPPP outlines specific practices and measures to control pollutants that may be discharged into water bodies, while the BMP plan offers strategies and techniques specifically tailored for construction sites to mitigate these issues. Consequently, both share fundamental goals and operational protocols pertaining to site management and environmental protection. In contrast, while a Water Quality Management Plan focuses on long-term water quality objectives and regulations, an Erosion Control Plan generally emphasizes minimizing soil erosion without the broader pollution control measures required by a SWPPP. A Site Soil Conservation Plan is concerned primarily with the preservation of soil resources and preventing degradation, which, while important, does not encompass the same range of stormwater management directives as a SWPPP.

6. If the hydraulic radius for full flow condition is calculated as $D/4$, what does this refer to?

A. Half the diameter

B. One-fourth of the diameter

C. Flow area divided by flow perimeter

D. The critical depth of flow

The hydraulic radius is defined as the ratio of the flow area to the wetted perimeter in open channel flow. In the case of a circular pipe flowing full, the hydraulic radius (R) can be calculated using the formula $R = A/P$, where A is the flow area and P is the wetted perimeter. For a fully flowing circular pipe, the flow area (A) can be determined as the area of the circle ($A = \pi D^2/4$) and the wetted perimeter (P) is equal to the diameter ($P = D$). Therefore, the hydraulic radius can be calculated as: $R = \frac{A}{P} = \frac{\frac{\pi D^2}{4}}{D} = \frac{\pi D}{4}$. However, when considering only the relationship of $D/4$, it signifies a specific ratio derived from the full flow condition, indicating that the hydraulic radius in this instance is a quarter of the diameter of the pipe (D). This unique relationship is particularly important in hydraulic design and analysis as it helps characterize flow behavior under full flow conditions. It is essentially noting that when we consider D divided by 4, we are explicitly referring to one-fourth of the diameter.

7. What effect does an increase in the F:M ratio have in wastewater treatment?

- A. Pursuance of sludge removal**
- B. Decrease in MLSS**
- C. Promotion of biological growth**
- D. Reduction in SVI**

An increase in the Food-to-Microorganism (F:M) ratio in wastewater treatment signifies a higher concentration of organic substrates available for biological organisms relative to the amount of microorganisms present. This condition typically promotes biological growth. When there is more food available, microorganisms can multiply more rapidly, leading to increased biomass production. In activated sludge systems, an appropriate balance of the F:M ratio is crucial. If the F:M ratio is too high, while biological growth is enhanced, this can also result in other operational challenges, such as potential settling issues or more frequent sludge removal requirements. However, the primary effect is the stimulation of microbial growth, which is essential for achieving effective treatment of wastewater. Understanding the F:M ratio and its implications is key to managing and optimizing biological treatment processes, particularly in ensuring that the system can efficiently degrade organic matter while maintaining stable operational conditions.

8. Which parameters would likely be limited in a discharge permit to prevent eutrophication?

- A. BOD5, total iron**
- B. SS, ammonia**
- C. BOD5, Total N, Total P**
- D. pH, total ammonia**

The focus on preventing eutrophication in discharge permits centers around the control of nutrients that can lead to excessive growth of algae and aquatic plants. In this context, Total Nitrogen (Total N) and Total Phosphorus (Total P) are the primary parameters of concern. Eutrophication is driven by an overabundance of nutrients, particularly phosphorus and nitrogen, in water bodies. When these nutrients are discharged in excessive amounts, they can stimulate algal blooms, leading to adverse effects on water quality, such as decreased oxygen levels, harmful algal blooms, and disruptions in aquatic ecosystems. BOD5, while it indicates the organic matter in water that can deplete oxygen, does not directly contribute to eutrophication the way nitrogen and phosphorus do. Therefore, while it may be monitored for overall water quality, it is not the main parameter targeted for preventing eutrophication. In summary, the parameters included in the correct response—Total N and Total P—are directly related to the processes that lead to eutrophication, which is why they are likely to be limited in a discharge permit aimed at mitigating this environmental issue.

9. What fundamental principle governs fluid motion and is applicable in flow calculation?

- A. Conservation of momentum**
- B. Conservation of mass**
- C. Bernoulli's principle**
- D. Hydraulic conductivity**

The principle that governs fluid motion and is most widely applicable in flow calculation is Bernoulli's principle. This principle states that within a flowing fluid, an increase in the fluid's speed occurs simultaneously with a decrease in pressure or potential energy. Bernoulli's equation, derived from this principle, describes the relationship between the velocity of a fluid, its pressure, and its height within a flow system, making it a fundamental tool in fluid dynamics. Bernoulli's principle is particularly useful in various engineering applications such as the design of piping systems, understanding airflow over wings, and analyzing open channel flows. It provides insights into how changes in a fluid's velocity affect its pressure and can predict how fluid will behave under certain conditions, which is essential for accurate flow calculations. While conservation of momentum and conservation of mass are both important principles in fluid mechanics, they serve different functions. Conservation of mass, for example, relates to how mass is conserved in a closed system and is often encapsulated by the continuity equation. Conservation of momentum deals with the forces acting on and resulting from fluid motion but does not directly provide a relationship among pressure, velocity, and elevation as Bernoulli's principle does. Hydraulic conductivity, on the other hand, relates to how easily

10. What causes elastic settlement of the ground due to a surface load?

- A. Deformation of soil with a change in water content**
- B. Deformation of soil without a change in its water content**
- C. Increase in groundwater levels**
- D. Soil consolidation from overburden pressure**

Elastic settlement occurs when a surface load is applied to the ground, causing the soil to deform while maintaining the same volume of water within its pore spaces. This type of settlement is characterized by immediate and recoverable deformation due to the compacting of soil particles in response to the applied load. When a load is applied, the stress at the soil surface increases, leading to deformation as the soil adjusts to the new load without any accompanying changes in water content. This is important because, in elastic settlement, the soil skeleton itself bears the load, and the water remains within the pores, effectively causing the soil structure to compress elastically. This contrasts with other types of soil behavior, such as consolidation, which involves a change in water content as excess pore water pressures dissipate and water is expelled from the soil. The instantaneous nature of elastic settlement makes it critical in foundation design, as it can lead to immediate deflections after load application, even before any significant consolidation takes place. Understanding this process is essential for civil engineers when designing structures and predicting ground behavior under loading conditions.

Next Steps

Congratulations on reaching the final section of this guide. You've taken a meaningful step toward passing your certification exam and advancing your career.

As you continue preparing, remember that consistent practice, review, and self-reflection are key to success. Make time to revisit difficult topics, simulate exam conditions, and track your progress along the way.

If you need help, have suggestions, or want to share feedback, we'd love to hear from you. Reach out to our team at hello@examzify.com.

Or visit your dedicated course page for more study tools and resources:

<https://pe-civilwaterresource.examzify.com>

We wish you the very best on your exam journey. You've got this!