Illinois Class D Water License Practice Exam (Sample)

Study Guide

Everything you need from our exam experts!

Questions

1. What is the purpose of a well casting vent?

- **A. To allow air to enter the well during drawdown**
- **B. To measure the water level in the well**
- **C. To remove excess gravel from the well**
- **D. To support the pumping unit**

2. What defines free chlorine in a water treatment context?

- **A. The portion that is chemically reacted**
- **B. The total amount of chlorine present**
- **C. The amount remaining after the demand for chlorine has been met**
- **D. Chlorine combined with ammonia**

3. What occurs when a pump stops and a check valve is present?

- **A. Water continues to flow into the well**
- **B. Water is circulated back into the supply**
- **C. Water cannot flow back, maintaining system pressure**
- **D. Air is released to the atmosphere**

4. What issue can arise from low oxygen levels in waterways?

- **A. Increased recreational activities**
- **B. Improved water temperature**
- **C. Decreased aquatic life health**
- **D. Enhanced photosynthesis**

5. What can happen if drinking water has high levels of lead?

- **A. It can improve water flavor**
- **B. It can cause health issues**
- **C. It can enhance water flow**
- **D. It may increase water temperature**

6. Which type of material is specifically prohibited as backfill for water mains?

A. Soil

B. Sand

C. Cinders

D. Rock

7. How much pressure (in psi) does 1 foot of elevation provide?

A. 1.5 psi

B. 2.31 psi

C. 3.0 psi

D. 2.0 psi

8. How often should bacteriological samples be collected from a water system?

A. Every week

B. Monthly

C. Quarterly

D. Every six months

9. What is one way to improve a public water supply's financial status?

A. By hiring more staff

B. By increasing water rates indiscriminately

C. By conducting regular water audits

D. By reducing system capacity

10. Cathodic protection in a storage tank is?

A. A method of increasing water flow

B. A small electric current used to prevent rust, corrosion, and pitting of metal surfaces

C. A technique for enhancing water taste

D. A measure for water temperature control

Answers

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

Explanations

1. What is the purpose of a well casting vent?

- A. To allow air to enter the well during drawdown
- B. To measure the water level in the well
- C. To remove excess gravel from the well
- D. To support the pumping unit

The purpose of a well casting vent is to allow air to enter the well during drawdown. When water is drawn from a well, a vacuum can be created if air cannot enter the well to replace the water being removed. This lack of air can hinder the flow of water and affect the functioning of the well system. The vent serves as a crucial component in maintaining pressure equilibrium within the well, ensuring a steady flow of water by preventing the formation of a vacuum that could restrict access to groundwater. In this context, measuring the water level is typically done using other instruments like dipsticks or electronic level sensors, rather than through the vent. Removing excess gravel is not a function of the vent; rather, gravel packing is used to support the well structure and filter out sediments. The support of the pumping unit involves physical structures and components designed to stabilize and operate the pumping mechanism, not the vent itself. Thus, the well casting vent plays a vital role in maintaining the functionality and efficiency of the well by facilitating the movement of air during the drawdown process.

2. What defines free chlorine in a water treatment context?

- A. The portion that is chemically reacted
- B. The total amount of chlorine present
- C. The amount remaining after the demand for chlorine has been met
- D. Chlorine combined with ammonia

Free chlorine refers to the amount of chlorine that remains in the water after its initial demand has been satisfied, meaning it is available for disinfection purposes. It primarily includes hypochlorous acid and hypochlorite ion, which are the active forms of chlorine that effectively kill pathogens in the water. When treatment occurs, chlorine is added to the water to eliminate bacteria and other microorganisms. However, some of the chlorine is consumed in reacting with contaminants, such as organic matter or ammonia. Once this initial demand is met, the residual chlorine that persists is labeled as free chlorine. This measurement is critical in water treatment because it indicates how much disinfectant is still active and available to maintain water quality and safety. The other options don't accurately capture the concept of free chlorine. Chemically reacted chlorine would pertain to chlorine that has already engaged with substances in the water. The total amount of chlorine present would encompass both free and combined chlorine, while chlorine combined with ammonia refers specifically to chloramines, which are less effective in disinfection compared to free chlorine. Therefore, the choice that highlights the chlorine remaining after consumption by pollutants is the correct representation of free chlorine in water treatment.

3. What occurs when a pump stops and a check valve is present?

A. Water continues to flow into the well

B. Water is circulated back into the supply

C. Water cannot flow back, maintaining system pressure

D. Air is released to the atmosphere

When a pump stops and a check valve is present, the correct outcome involves water not being able to flow back into the system, which helps maintain system pressure. A check valve functions by allowing fluid to flow in only one direction. This design is crucial in preventing backflow, which can lead to contamination or loss of pressure in the water supply system. In this situation, once the pump halts, the check valve closes, effectively creating a barrier that keeps the water in the pressurized system from returning to the source or well. This is vital for ensuring a reliable and consistent water supply when the pump is activated again, as well as for maintaining pressure throughout the system. The other options do not accurately reflect the role of the check valve. For instance, water continuing to flow into the well or being circulated back into the supply implies fluid movement that contradicts the check valve's function, while the release of air to the atmosphere would suggest a loss of pressure or a malfunction in the system rather than the intended operation of a check valve.

4. What issue can arise from low oxygen levels in waterways?

A. Increased recreational activities

B. Improved water temperature

C. Decreased aquatic life health

D. Enhanced photosynthesis

Low oxygen levels in waterways can significantly harm aquatic life, leading to decreased health among various organisms. Aquatic life, including fish, invertebrates, and microorganisms, relies on dissolved oxygen in the water for respiration and survival. When oxygen levels drop, these organisms may struggle to obtain the necessary oxygen to sustain themselves, resulting in stress, reduced growth rates, reproductive issues, and even mortality. Additionally, lower oxygen levels can lead to the alteration of the ecosystem's balance, favoring the growth of anaerobic bacteria over aerobic organisms, which further degrades water quality. Consequently, a decline in aquatic life health can disrupt the entire aquatic ecosystem, affecting food webs and ultimately leading to a less biodiverse environment. In contrast, increased recreational activities, improved water temperature, and enhanced photosynthesis are generally positive outcomes for waterways and their ecosystems, but these can be adversely impacted by low oxygen levels.

5. What can happen if drinking water has high levels of lead?

A. It can improve water flavor

<u>B. It can cause health issues</u>

C. It can enhance water flow

D. It may increase water temperature

High levels of lead in drinking water can pose serious health risks, making the selected answer significant. Lead is a toxic metal that, when ingested, can accumulate in the body over time and negatively impact various bodily functions. Particularly vulnerable groups, such as children and pregnant women, can experience developmental delays, cognitive impairments, and damage to the brain and nervous system. Additionally, lead exposure can lead to renal issues and increased blood pressure in adults. The presence of lead in drinking water typically arises from the corrosion of pipes and plumbing fixtures that contain lead, especially in older buildings. It is essential for water treatment and distribution systems to monitor and control lead levels to protect public health. Other options incorrectly imply benefits or neutral effects of lead in drinking water. For instance, lead does not improve water flavor or enhance flow; instead, it contributes to contamination. Likewise, it does not influence water temperature. Recognizing the dangers of lead is crucial for ensuring safe drinking water and public health.

6. Which type of material is specifically prohibited as backfill for water mains?

A. Soil

B. Sand

<u>C. Cinders</u>

D. Rock

Cinders are specifically prohibited as backfill for water mains due to their potentially harmful characteristics. Cinders, which are a byproduct of combustion processes, can create voids and air pockets around the water main, leading to insufficient support and possible structural issues over time. They can also retain moisture, which may promote corrosion of the pipes, especially if the cinders contain soluble materials or chemicals that can leach into the surrounding soil. In contrast, soil, sand, and rock have properties that make them more suitable for backfilling. Soil and sand can provide adequate support and compaction around the pipes, helping to stabilize them and reduce movement. Rock, when used properly, can also create a solid foundation, provided that it is appropriately sized and placed to avoid causing damage to the water main. Each of these other materials adheres to engineering principles aimed at maintaining the integrity and longevity of water infrastructure.

7. How much pressure (in psi) does 1 foot of elevation provide?

A. 1.5 psi

B. 2.31 psi

C. 3.0 psi

D. 2.0 psi

The correct answer is 2.31 psi for every foot of elevation gained. This value is derived from the basic principle of hydrostatic pressure, which states that pressure increases with the depth of a fluid column due to the weight of the fluid above it. In water systems, each foot of elevation corresponds to a specific pressure due to the weight of the water. The calculation for this pressure is based on the density of water, where one cubic foot of water weighs approximately 62.4 pounds. The formula for converting elevation height in feet to pressure in psi (pounds per square inch) involves the relationship that for water, approximately every foot of elevation gains about 0.433 psi. Therefore, when you multiply 0.433 psi by the number of feet of elevation (1 foot), you arrive at roughly 0.433 psi per foot, but more commonly used overall is the fact that 1 foot of elevation provides around 2.31 psi of pressure. This standard reference is essential in water distribution systems, where elevation changes can significantly impact the pressure experienced at various points in the system. Understanding this relationship is crucial for ensuring adequate water pressure in municipal and industrial applications, particularly in situations where elevation changes occur, such as in h

8. How often should bacteriological samples be collected from a water system?

A. Every week

B. Monthly

C. Quarterly

D. Every six months

Bacteriological samples are critical for ensuring that the water system is safe for public consumption and meets health standards. Collecting these samples monthly strikes an effective balance between monitoring water quality and practical operational considerations. Monthly sampling allows for timely detection of any potential contamination or microbial growth in the water supply. This frequency helps ensure that any issues can be addressed promptly before they pose health risks to consumers. Regular monthly testing also provides a consistent dataset, enabling water operators to track trends in water quality over time, leading to better management and operational decisions. Other options, such as sampling every week, may be overly burdensome and resource-intensive for many systems, especially smaller ones, while quarterly or every six months may allow too much time to pass between samples, potentially resulting in undetected contamination or changes in water quality that could affect public health. Thus, monthly sampling is generally regarded as the best practice for routine bacteriological monitoring.

9. What is one way to improve a public water supply's financial status?

A. By hiring more staff

B. By increasing water rates indiscriminately

C. By conducting regular water audits

D. By reducing system capacity

Conducting regular water audits is an effective strategy to enhance a public water supply's financial status. Water audits enable facilities to assess their water usage comprehensively, identify leaks, and reduce wasteful practices. By understanding exactly where water is being used and where losses are occurring, system operators can implement targeted interventions to conserve water. This leads to reduced operational costs and improved efficiency in water delivery. Additionally, minimizing water loss through audits can translate to lower treatment costs and increased revenue by maximizing the volume of water provided to customers. Other options could undermine financial stability. For instance, hiring more staff may increase operational costs, and increasing water rates indiscriminately could drive customers to reduce their consumption or seek alternative sources of water. Reducing system capacity could lead to decreased availability of water, potentially harming the community and leading to a loss in revenue. In contrast, conducting water audits offers a proactive approach to ensuring the sustainability and financial health of the water supply system.

10. Cathodic protection in a storage tank is?

A. A method of increasing water flow

B. A small electric current used to prevent rust, corrosion, and pitting of metal surfaces

C. A technique for enhancing water taste

D. A measure for water temperature control

Cathodic protection in a storage tank involves using a small electric current to mitigate the processes that lead to rust, corrosion, and pitting of metal surfaces. This method is particularly important for protecting metal tanks that store water or other substances, as it helps maintain the integrity of the tank structure over time. The principle behind cathodic protection is based on electrochemistry, where the metal structure (the anode) is protected by being made the cathode in an electrochemical cell. By doing so, the electrochemical reactions that would typically lead to corrosion are inhibited, effectively extending the lifespan of the storage tank. This is essential for ensuring safe water storage and minimizing maintenance costs. The other options pertain to different functions that do not align with the specific action of cathodic protection. Increasing water flow, enhancing water taste, or controlling water temperature do not relate to the key aspect of preventing metal degradation, which is the primary purpose of cathodic protection.