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PRACTICE QUESTIONS

Colorado Certified Water Professionals

QXGUBZRV

Colorado Wastewater Collection System Operator Class 3

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Demo

QUESTIONS

9

FORMAT

Limited Edition PDF

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What this is

9 practice questions for Colorado Certified Water Professionals **QXGUBZRV**, each with its answer key and an explanation. Answer a question before you read its key — the explanation is worth more once you have committed.

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QUESTION 1

SINGLE CHOICE

A Class 3 collection system operator is entering a manhole that has been opened and ventilated but not yet tested for hazardous atmospheres. According to OSHA confined-space rules (29 CFR 1910.146), which sequence of actions must be completed BEFORE any worker descends into the space?

- ☐ **A** Connect a supplied-air respirator to the worker, lower a ladder, then begin work
- ☒ **B** Test the atmosphere for oxygen, flammability, and hydrogen sulfide in that order from top to bottom, then continuously monitor while occupied
- ☐ **C** Ventilate for 30 minutes, then enter with a four-gas meter clipped to the worker's belt
- ☐ **D** Issue a hot work permit, ignite a torch at the rim to burn off gases, then lower a ladder

ANSWER B

WHY Under 29 CFR 1910.146 (Permit-Required Confined Spaces), atmospheric testing must be performed in a specific order — oxygen first, then combustible gases, then toxic gases such as H₂S — starting from outside the space and proceeding top to bottom. Ventilation and monitoring are required in addition to testing, but testing in the correct order from outside the space is the mandatory pre-entry step. Option A skips atmospheric testing entirely; Option C reverses the procedure and omits entry-permit requirements; Option D describes an unsafe practice.

QUESTION 2

SINGLE CHOICE

Two submersible pumps in a duplex lift station operate on a common lead-lag alternator with a high-level alarm at the wet-well. After a power outage, the station calls out on the high-level alarm even though both pumps appear to be calling to run. The most likely cause is:

- ☐ A The alternator has lost power to its 120-V control coil and all pumps will run simultaneously
- ☐ B The check valves on the discharge are passing and equalizing the wet-well with the force main
- ☐ C The seal-failure probes in the pumps are detecting moisture and disabling the pumps through the seal-failure relay
- ☒ D The pressure transducer is siphoning and reading a level about 3 feet below the true level

ANSWER D

WHY A common failure after a power interruption is a siphoning (or 'read-down') condition in a non-pressurized level-sensing line on a bubbler or hydrostatic transducer, in which water left in the reference line causes the controller to believe the wet well is lower than it actually is. The pumps therefore shut off prematurely and the wet well rises to the high-level float, generating a high-level alarm. The other choices describe real but unrelated pump-station problems: a loss of alternator coil power generally forces a fixed 'lead' rather than no operation, failed check valves usually show as cycling, and seal-failure relays typically generate a SCADA alarm rather than disable both pumps.

QUESTION 3

SINGLE CHOICE

A 15-inch diameter sanitary sewer is flowing at one-third of its depth with a uniform flow of 2.0 MGD. The operator needs to estimate the flow velocity using Manning's equation. Which variable has the GREATEST effect on the calculated velocity for a small change in its value?

- ☐ A Pipe diameter, because it is squared in the hydraulic radius calculation
- ☐ B Manning's roughness coefficient (n), because it appears in the denominator
- ☐ C Slope, because velocity is proportional to the square root of slope
- ☒ D Depth of flow, because partial-flow hydraulics are nonlinear below the half-full point

ANSWER D

WHY At one-third depth, the partial-flow hydraulic elements (hydraulic radius, area, and the proportionality constants in the Manning equation) are changing very rapidly with depth in this region of the curve. A small change in depth at $d/D = 0.33$ produces a much larger percentage change in velocity than the same proportional change in diameter, slope, or roughness. Diameter and slope are first- and second-power terms and roughness is first-power, so none is as sensitive as the partial-depth curve in the lower third of the pipe.

QUESTION 4

SINGLE CHOICE

A 24-inch trunk sewer in a residential area has heavy grease accumulation. Which combination of cleaning methods is most appropriate as a first-pass approach without first exposing the line for direct cleaning?

- ☐ A Rodding with a power rodder and an auger cutter
- ☒ B Flushing with a hydraulic ball followed by a high-velocity jetter with a rotating nozzle
- ☐ C Chemical dosing with sodium hydroxide followed by a sewer ball
- ☐ D Hand cleaning through a manhole with shovels and a bucket

ANSWER B

WHY Hydraulic balls (sewer balls) and high-velocity jet-cleaning equipment are the standard methods for removing grease from large-diameter sanitary sewers without excavation. The ball creates a dam and pulse-flushes deposits downstream, and a jetter with a rotating nozzle scrubs the pipe wall. Rodding is more appropriate for smaller-diameter laterals, chemical dosing of sodium hydroxide into a live sewer is generally discouraged and regulated as a discharge, and hand cleaning through a manhole is unsafe and impractical for a 24-inch line.

QUESTION 5

SINGLE CHOICE

A new 8-inch PVC sewer is being installed at a slope of 0.40 percent (0.004 ft/ft). For an 8-inch pipe with Manning's $n = 0.013$, what is the approximate velocity when the pipe is flowing full?

- ☐ A 1.2 ft/s
- ☒ B 2.1 ft/s
- ☐ C 3.0 ft/s
- ☐ D 4.5 ft/s

ANSWER B

WHY Using Manning's equation for a full-flowing pipe: $V = (1.486 / n) * R^{(2/3)} * S^{(1/2)}$. For an 8-inch pipe ($D = 0.667$ ft), the full-flow hydraulic radius $R = D/4 = 0.167$ ft. $V = (1.486 / 0.013) * (0.167)^{(2/3)} * (0.004)^{(1/2)} = 114.3 * 0.301 * 0.0632 \approx 2.18$ ft/s. This is above the typical minimum self-cleaning velocity of 2.0 ft/s and well below the maximum scour velocity of about 10 ft/s, so 2.1 ft/s is the correct answer.

QUESTION 6

SINGLE CHOICE

Under the EPA Sanitary Sewer Overflow (SSO) reporting requirements, an operator discovers an overflow from a manhole that discharges into a storm drain leading to a waterway. Which action is required?

- ☐ A Stop the overflow and document the volume internally; no external reporting is required if the overflow is less than 1,000 gallons
- ☒ B Notify the appropriate state agency within 24 hours and submit a written report describing the cause, volume, and corrective actions
- ☐ C Wait until the end of the month and include the event in the routine discharge monitoring report (DMR)
- ☐ D Report only if fish kill or property damage is observed

ANSWER B

WHY Federal SSO reporting rules (originally established by the EPA SSO Rule of 2005 and carried forward into NPDES permits and state programs) require notification of the primacy agency within 24 hours of discovery and a follow-up written report documenting the location, estimated volume, receiving waters, cause, and corrective actions. There is no minimum-volume threshold that exempts reporting, the routine DMR is not the vehicle for SSO reporting, and environmental damage thresholds are reporting triggers but do not replace the standard reporting duty.

QUESTION 7

SINGLE CHOICE

An operator is starting a centrifugal pump that has been out of service for several weeks. After confirming the pump is primed and the suction valve is open, the operator should:

- ☐ **A** Crack the discharge valve, energize the motor, and then slowly open the discharge valve while monitoring amperage
- ☒ **B** Close the discharge valve, energize the motor, then slowly open the discharge valve while monitoring amperage
- ☐ **C** Open the discharge valve fully, then energize the motor while monitoring amperage
- ☐ **D** Open the discharge valve fully, then energize the motor, and then close the suction valve

ANSWER B

WHY Centrifugal pumps should be started with the discharge valve closed (or barely cracked) to reduce the starting load on the motor, and then the discharge valve should be opened slowly while the operator watches the ammeter to make sure the motor does not overload as flow increases. This is standard pump-operations practice and is what is taught at the Class 3 level. Option A starts against an open discharge, which can stall a motor on a long force main; Option C can cause severe water hammer; Option D will starve the pump and cause cavitation.

QUESTION 8

MULTIPLE CHOICE

A crew is preparing to perform routine maintenance on a 60-inch interceptor that has been isolated, dewatered, and ventilated. Which items of personal protective equipment (PPE) are typically required for entry? (Choose three.)

- ☒ **A** Harness with retrieval line attached to a tripod and winch
- ☒ **B** Supplied-air respirator (SAR) or self-contained breathing apparatus (SCBA)
- ☐ **C** High-visibility traffic vest and hard hat
- ☒ **D** Steel-toed rubber boots and chemical-resistant gloves
- ☐ **E** Disposable cotton dust mask and safety glasses only

ANSWER A • B • D

WHY Permit-required confined-space entry requires: (A) a full-body harness with retrieval line and a mechanical means of retrieval such as a tripod and winch, (B) supplied-air respiratory protection because the atmosphere cannot be assumed to be safe even after ventilation and testing, and (D) chemical-resistant boots and gloves to protect against contact with residual sewage and debris. A high-visibility vest and hard hat (C) are appropriate for surface work but are not the specific confined-space entry PPE. A dust mask and safety glasses (E) do not provide respiratory protection against H₂S or oxygen-deficient atmospheres and are inadequate.

QUESTION 9

MULTIPLE CHOICE

Which of the following are common causes of hydrogen sulfide (H₂S) generation and release in a sanitary sewer? (Choose two.)

- ☒ **A** Long detention times and high temperatures in force mains
- ☒ **B** Turbulent flow at drop manholes, siphons, and pump discharges
- ☐ **C** Use of PVC pipe with a Manning's n of 0.009
- ☐ **D** Routine hydraulic cleaning with a jetter at 2,000 psi

ANSWER A • B

WHY H₂S is generated by anaerobic bacteria that reduce sulfate in the sewage, especially when wastewater sits in a force main or flat sewer at elevated temperatures for long periods (A). When the sulfide-laden wastewater is then disturbed by turbulence at drop manholes, siphons, or pump discharges, H₂S is stripped from solution into the sewer headspace, where it can attack concrete pipe and endanger workers (B). PVC pipe with a low roughness coefficient (C) and routine jetter cleaning (D) are not significant causes of H₂S release.