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39	☒ A	☐ B	☐ C	☐ D	☐ E

PRACTICE QUESTIONS

Connecticut - Dept of Energy and Environmental Protection

QXGUBT9X

Connecticut Wastewater Treatment Operator Class 3

EDITION

Demo

QUESTIONS

9

FORMAT

Limited Edition PDF

Before you begin

What this is

9 practice questions for Connecticut - Dept of Energy and Environmental Protection QXGUBT9X , 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.

If something looks wrong

Send us three things and we will check it:

- the exam code, QXGUBT9X
- the question number
- the email address on your order

Write to **support@mometrix.net**. We reply within one business day.

QUESTION 1

MULTIPLE CHOICE

Which of the following are typical unit processes or operations commonly found in the preliminary treatment stage of a conventional wastewater treatment plant? (Choose two.)

- ☒ **A** Bar screens to remove large debris
- ☒ **B** Grit chambers to settle sand and gravel
- ☐ **C** Activated sludge aeration basins
- ☐ **D** Chlorine contact tanks for disinfection
- ☐ **E** Anaerobic digesters for sludge stabilization

ANSWER A - B

WHY Preliminary treatment typically includes physical processes such as bar screens (to remove rags, sticks, and large objects) and grit chambers (to remove sand, gravel, and other heavy inorganic solids). Activated sludge aeration basins are part of secondary treatment, while chlorine contact tanks are disinfection (tertiary/post-secondary) and anaerobic digesters are part of solids/sludge handling — none of which occur in preliminary treatment.

QUESTION 2

MULTIPLE CHOICE

An operator calculates the Food-to-Microorganism ratio (F/M) for an activated sludge aeration basin. Which of the following inputs are required for that calculation? (Choose two.)

- ☒ **A** Influent BOD5 loading to the aeration basin (lb/day)
- ☒ **B** Mixed liquor suspended solids (MLSS) in the aeration basin (mg/L)
- ☐ **C** Chlorine residual in the effluent (mg/L)
- ☐ **D** Mixed liquor volatile suspended solids (MLVSS) times the aeration basin volume
- ☐ **E** Total suspended solids in the primary effluent (mg/L)

ANSWER A - B

WHY The F/M ratio is calculated as the BOD5 (or sometimes COD) food loading entering the aeration basin divided by the mass of mixed liquor suspended solids (or MLVSS) under aeration. Influent BOD5 loading (A) and the MLSS inventory (B) are therefore required. Chlorine residual is unrelated, and primary effluent TSS is not the standard input. Although MLVSS can be substituted for MLSS, the operator must use the volatile fraction specifically, making (D) incorrect as written.

QUESTION 3

TRUE FALSE

True or False: In a conventional activated sludge system, a rising sludge condition in the secondary clarifier is most commonly caused by denitrification in the sludge blanket, which releases nitrogen gas that buoys solids to the surface.

- ☒ **A** True
- ☐ **B** False

ANSWER A

WHY True. Rising sludge in secondary clarifiers is classically caused by denitrification occurring within the sludge blanket. Nitrate is converted to nitrogen gas (N₂), and the entrained gas bubbles attach to sludge flocs, reducing their effective density and floating them to the clarifier surface. The standard corrective action is to increase the sludge wasting rate to reduce the sludge retention time in the clarifier and decrease return activated sludge (RAS) nitrate levels.

QUESTION 4

SINGLE CHOICE

A wastewater sample is sent to the laboratory for analysis. Which analytical result is expressed as a five-day biochemical oxygen demand (BOD5)?

- ☒ **A** The amount of oxygen consumed by microorganisms while decomposing organic matter over a five-day period at 20 °C
- ☐ **B** The amount of oxygen required to chemically oxidize all organic matter using a strong oxidant
- ☐ **C** The mass of suspended solids retained on a filter after drying at 103–105 °C
- ☐ **D** The amount of free chlorine residual remaining after a 30-minute contact time

ANSWER A

WHY BOD5 is a five-day bioassay in which a sealed sample is incubated at 20 °C and the dissolved oxygen depletion is measured. Option (B) describes COD, (C) describes total suspended solids (TSS), and (D) describes a chlorine residual — none of which is BOD5.

QUESTION 5

SINGLE CHOICE

Which of the following is the single most important operational parameter that must be controlled to achieve effective disinfection with chlorine in a wastewater contact tank?

- ☐ **A** The color of the wastewater entering the tank
- ☒ **B** The contact time (CT) between the chlorine residual and the wastewater
- ☐ **C** The diameter of the chlorine feed line
- ☐ **D** The brand of sodium hypochlorite being used

ANSWER B

WHY For chlorine disinfection, performance is governed by the product of chlorine residual concentration (C) and contact time (T), commonly expressed as CT. Adequate CT, along with proper mixing, must be maintained to achieve the required log inactivation of indicator organisms such as fecal coliforms. Color, feed line diameter, and chemical brand do not directly determine disinfection effectiveness.

QUESTION 6

SINGLE CHOICE

In a trickling filter, the slime layer (biological film) that grows on the media performs which primary function?

- ☒ **A** It adsorbs and biologically oxidizes dissolved and fine suspended organic matter as wastewater trickles over it
- ☐ **B** It provides a physical barrier that filters out all suspended solids without biological activity
- ☐ **C** It generates chlorine gas for in-tank disinfection of the trickling filter effluent
- ☐ **D** It functions solely as insulation to keep the wastewater warm during cold weather

ANSWER A

WHY A trickling filter is a fixed-film, aerobic biological treatment process. Microorganisms attached to the media as a zoogeal slime layer (biofilm) absorb and biologically oxidize organic matter from the wastewater as it passes over the media. Sloughed biofilm leaves the filter as humus and is removed in the secondary clarifier. The other options mischaracterize the process.

QUESTION 7

SINGLE CHOICE

Which of the following best describes the primary purpose of an anaerobic digester at a wastewater treatment plant?

- ☐ **A** To thicken raw primary sludge prior to dewatering
- ☒ **B** To biologically stabilize organic solids and produce biogas (primarily methane and carbon dioxide) in the absence of oxygen
- ☐ **C** To add chlorine to the sludge for pathogen destruction before land application
- ☐ **D** To remove grit and inorganic debris from the sludge stream

ANSWER B

WHY An anaerobic digester stabilizes organic sludge in an oxygen-free environment. Anaerobic microorganisms convert volatile organic solids into biogas (roughly 60–70% methane and 30–40% carbon dioxide, with traces of hydrogen sulfide), reducing sludge volume and odor potential and producing a stabilized biosolids product. Thickening (A) is a separate unit process, chlorine addition (C) is not a digester function, and grit removal (D) occurs upstream of digestion.

QUESTION 8

SINGLE CHOICE

A primary clarifier has a volume of 50,000 gallons and receives an average flow of 250,000 gallons per day. What is the hydraulic detention time of the clarifier, in hours?

- ☐ A 0.2 hours
- ☐ B 2 hours
- ☒ C 4.8 hours
- ☐ D 24 hours

ANSWER C

WHY Detention time (DT) = Volume ÷ Flow = 50,000 gal ÷ 250,000 gal/day = 0.2 day. Converting to hours: 0.2 day × 24 hr/day = 4.8 hours. This value is typical for a primary clarifier, which is generally designed for 1.5 to 2.5 hours of detention at average flow but may be longer at lower design loading rates.

QUESTION 9

SINGLE CHOICE

During routine monitoring, an operator notes that the dissolved oxygen (DO) in the aeration tank of an activated sludge system has dropped to 0.4 mg/L, and the mixed liquor has a dark, septic appearance. The most appropriate immediate operator action is to:

- ☒ A Increase the air supply to the aeration tank and investigate the cause of the oxygen demand
- ☐ B Reduce the return activated sludge (RAS) rate to zero to stop oxygen consumption
- ☐ C Immediately close the chlorinator to prevent overdosing
- ☐ D Stop wasting sludge to increase the MLSS concentration

ANSWER A

WHY An DO level near zero with dark, septic mixed liquor indicates that the aeration system cannot meet the oxygen demand, which can lead to poor BOD removal, settling problems, and rising sludge. The correct response is to restore aerobic conditions by increasing the air supply (for example, by turning on additional blowers or adjusting diffuser valves) and then investigate the cause of the increased load or equipment problem. Stopping RAS, stopping wasting, or shutting off a chlorinator do not address the underlying oxygen deficit and would worsen biological treatment.