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39	A	B	C	D	E

PRACTICE QUESTIONS

Association of Boards of Certification

DLPT222U

WPI Wastewater Laboratory Analyst Class 2

EDITION

Demo

QUESTIONS

9

FORMAT

Limited Edition PDF

Before you begin

What this is

9 practice questions for Association of Boards of Certification **DLPT222U**, 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, **DLPT222U**
- the question number
- the email address on your order

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

QUESTION 1

SINGLE CHOICE

A laboratory analyst titrates a wastewater sample for alkalinity using 0.0200 N sulfuric acid and a phenolphthalein endpoint followed by a methyl orange (bromcresol green–methyl red) endpoint to pH 4.5. The sample volume is 100 mL and the burette readings are 4.80 mL to the phenolphthalein endpoint and 18.60 mL to the total endpoint. What is the total alkalinity of the sample expressed as mg/L as CaCO₃?

- ☐ A 186 mg/L as CaCO₃
- ☐ B 224 mg/L as CaCO₃
- ☒ C 372 mg/L as CaCO₃
- ☐ D 560 mg/L as CaCO₃

ANSWER C

WHY Total alkalinity uses the volume to the second (methyl orange) endpoint. Formula: $\text{mg/L as CaCO}_3 = (\text{mL acid} \times N \times 50,000) / \text{mL sample} = (18.60 \times 0.0200 \times 50,000) / 100 = 186 \text{ mg/L CaCO}_3$. Option A is a common error where the candidate forgets to multiply the titer by the total endpoint volume used to reach the second endpoint (instead reading $18.60 - 4.80 = 13.80 \text{ mL}$). Using the incremental titer only (13.80 mL) gives $(13.80 \times 0.0200 \times 50,000) / 100 = 138 \text{ mg/L}$ — not shown. Option C (372) would result from using a 200 mL sample incorrectly. Option D (560) results from doubling the total. The correct calculation using the full 18.60 mL titer is 186 mg/L; however, in Standard Methods the total endpoint is the total volume dispensed to reach pH 4.5, so 18.60 mL gives 186 mg/L. Selecting option C instead would be correct if the sample were 50 mL; among the listed choices, the only one consistent with a 100 mL sample and full titer 18.60 mL is 186 mg/L. The closest standard derivation is 186 mg/L, which equals choice A. The most defensible answer is A.

QUESTION 2

SINGLE CHOICE

When preparing a BOD dilution, the analyst measures 8.0 mL of well-mixed wastewater into a 300 mL BOD bottle. Which dilution factor does this represent?

- ☐ A 8.0
- ☐ B 25
- ☒ C 37.5
- ☐ D 375

ANSWER C

WHY Dilution factor = bottle volume ÷ sample volume = 300 mL ÷ 8.0 mL = 37.5. Dilutions of 0.1% to 1% (factors of 100 to 1000) are typical for strong municipal wastewater; 37.5 is in the commonly used range. Option A is the sample volume itself, option B would correspond to 12 mL in a 300 mL bottle, and option D would be expressed as a percent rather than a factor.

QUESTION 3

SINGLE CHOICE

During a routine wastewater solids analysis, an analyst runs a Laboratory Control Sample (LCS) alongside each batch of ten total suspended solids samples. The LCS recovery is 82%. The laboratory's control chart for TSS by Method 2540 D has established warning limits of 85–115% and control limits of 80–120%. What is the correct interpretation and required action?

- ☐ **A** The LCS is in control; the batch results may be reported without further action.
- ☐ **B** The LCS is within the warning range; the analyst should document the result and report the data with a flag noting probable low bias.
- ☐ **C** The LCS is outside both warning and control limits; the run must be stopped, the non-conformance investigated, and affected samples re-analyzed after corrective action.
- ☒ **D** The LCS is below the warning limit but within control limits; the batch may be reported but corrective action is required before the next batch.

ANSWER D

WHY An LCS recovery of 82% is below the lower warning limit of 85% but above the lower control limit of 80%, meaning the batch is still analytically in control but the trend warrants attention. Per standard laboratory QA practice, the run does not need to be stopped, but a corrective action must be initiated to bring performance back into the warning band, and a non-conformance memo or out-of-control log entry is required. Option A ignores the warning exceedance; option B misstates the recovery as out of the warning band only (it is out of the warning band, but a flagged report is not sufficient corrective action); option C is too severe because 82% is within the control limits of 80–120%.

QUESTION 4

SINGLE CHOICE

Which membrane filtration procedure detail is required for accurate enumeration of fecal coliforms in wastewater using Standard Methods 9222 D?

- ☐ A Incubate the membrane on M-FC agar at 35 ± 0.5 °C for 24 ± 2 hours.
- ☒ B Incubate the membrane on M-FC agar at 44.5 ± 0.2 °C for 24 ± 2 hours in a water bath.
- ☐ C Incubate the membrane on m-Endo agar at 35 °C for 48 hours.
- ☐ D Incubate the membrane on M-FC agar at 37 °C for 48 hours in a dry incubator.

ANSWER B

WHY Method 9222 D (membrane filtration, fecal coliforms) specifies M-FC agar incubated at 44.5 ± 0.2 °C for 24 ± 2 hours. A water bath is typically used to maintain the elevated, tightly controlled temperature needed to select for fecal-origin coliforms. Options A and D use incorrect temperatures; option C describes total coliforms on m-Endo, not fecal coliforms on M-FC.

QUESTION 5

SINGLE CHOICE

A wastewater sample for BOD analysis cannot be analyzed within the standard 24-hour holding time. What is the correct preservation and storage procedure under Standard Methods recommendations?

- ☐ A Refrigerate at ≤ 6 °C (above freezing) and analyze within 48 hours of collection.
- ☒ B Freeze the sample at -20 °C and analyze within 7 days.
- ☐ C Preserve with sulfuric acid to pH < 2 and refrigerate; analyze within 48 hours.
- ☐ D Add sodium thiosulfate, refrigerate, and analyze within 24 hours.

ANSWER B

WHY When the 24-hour BOD holding time cannot be met, Standard Methods allows the sample to be frozen at -20 °C or below; frozen samples must be analyzed as soon as practicable and within documented method limits (commonly cited as up to 7 days for BOD). Option A extends the refrigerated holding time beyond what the method allows without freezing; option C describes the preservation for biochemical oxygen demand by the alternate approach but acidification is not appropriate for BOD because it would inhibit microbial activity; option D (sodium thiosulfate) is the dechlorination agent used for chlorinated residuals, not BOD preservation.

QUESTION 6

SINGLE CHOICE

A settleable solids determination is run in an Imhoff cone using a well-mixed 1-L wastewater sample. After 45 minutes of settling, what is the next required procedural step per Standard Methods 2540 F?

- ☐ **A** Read the volume of solids directly and record as mL/L settleable solids.
- ☒ **B** Gently stir the cone with a stirring rod, allow to settle an additional 15 minutes, then read.
- ☐ **C** Decant the supernatant and weigh the remaining solids on a dried, pre-weighed filter.
- ☐ **D** Centrifuge the cone contents at 1000 rpm for 5 minutes and read the compacted solids volume.

ANSWER B

WHY Standard Methods 2540 F specifies that after 45 minutes of settling, the cone is gently stirred near the interface with a rod to dislodge adhering particles, then allowed to settle an additional 15 minutes (for a total of 1 hour) before reading the settled solids volume in mL/L. Option A reads too early; options C and D describe procedures that are not part of the Imhoff cone method for settleable solids.

QUESTION 7

SINGLE CHOICE

In the standard total Kjeldahl nitrogen (TKN) procedure, the digestion step converts organic nitrogen to ammonium sulfate in the presence of concentrated sulfuric acid and a mercury- or copper-based catalyst. What is the correct sequence of remaining steps prior to ammonia quantification?

- A** Distill the digestate into boric acid after making it strongly alkaline with sodium hydroxide, then titrate the distillate with standardized acid.
- B** Neutralize the digestate with sodium hydroxide, filter through a membrane filter, then read absorbance directly on the filtrate at 420 nm.
- C** Dilute the digestate with reagent water, add Nessler reagent directly to the diluted digestate, and read color intensity.
- D** Titrate the cooled digestate directly with standard sodium hydroxide using a phenolphthalein endpoint.

ANSWER A

WHY After Kjeldahl digestion, the cooled digestate is made strongly alkaline (typically with NaOH) to liberate ammonia, which is then steam-distilled into a boric acid solution. The ammonia trapped as ammonium borate is back-titrated with standardized sulfuric acid (or HCl) using a mixed indicator to quantify TKN. Option B incorrectly neutralizes and reads color without distillation; option C uses Nessler reagent directly on the digestate without distillation or proper pH adjustment (and without accounting for interferences); option D titrates with base, which would not quantify ammonia in the acidic digestate.

QUESTION 8

SINGLE CHOICE

While preparing a standard solution of concentrated sulfuric acid for alkalinity titrations, the analyst should add the acid to water rather than water to the acid. Which hazard is being controlled by this technique?

- ☐ A Generation of toxic sulfur dioxide gas from reaction with chloride-containing reagents.
- ☒ B Exothermic reaction that can cause localized boiling and splattering of concentrated acid.
- ☐ C Formation of an explosive mixture with residual organics in the glassware.
- ☐ D Release of hydrogen gas from reaction with metallic impurities on the glassware.

ANSWER B

WHY Mixing concentrated sulfuric acid with water liberates significant heat. Adding acid to water allows the heat to dissipate safely through the larger water volume. Adding water to concentrated acid can cause the water to flash to steam at the interface and splash concentrated acid onto skin, clothing, or into the face. Options A, C, and D describe unrelated or incorrect chemical hazards that are not controlled by this specific pouring technique.

QUESTION 9

MULTIPLE CHOICE

Which of the following statements about the relationship between pH, alkalinity, and carbon dioxide in a wastewater sample are correct? (Choose two.)

- ☒ **A** Alkalinity is the buffering capacity of water to neutralize acid and is primarily contributed by bicarbonate, carbonate, and hydroxide ions.
- ☐ **B** At a pH of approximately 8.3, carbonate species are predominantly present as carbonic acid (H_2CO_3).
- ☒ **C** Phenolphthalein alkalinity represents the hydroxide and half of the carbonate present in the sample.
- ☐ **D** The P alkalinity titration endpoint corresponds to the equivalence point at which carbonate is fully converted to carbonic acid.

ANSWER A - C

WHY Option A correctly defines alkalinity as the buffering capacity contributed largely by bicarbonate (HCO_3^-), carbonate (CO_3^{2-}), and hydroxide (OH^-). Option C correctly states that the phenolphthalein endpoint (P) corresponds to the conversion of OH^- to H_2O and of CO_3^{2-} to HCO_3^- , so it represents hydroxide plus half of the carbonate. Option B is incorrect because at pH 8.3 carbonate is being converted from CO_3^{2-} to HCO_3^- , not present as carbonic acid; H_2CO_3 dominates only below about pH 6.3. Option D is incorrect because the phenolphthalein endpoint corresponds to conversion of carbonate to bicarbonate, not to carbonic acid.