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Gap Analysis Tool

Laboratory Analyst Grade 1

In the rows below, select "Do It All The Time", "Limited Experience" or "Never Do This" based on your current knowledge and experience. Based on your responses, you can asses your overall preparedness for each Domain.

	Do It All The Time	Limited Experience	Never Do This
Domain 1 – Sample Collection, Testing, and Analysis			
Sub-Domain 1.1 – Basic Water and Wastewater Laboratory Knowledge			
1. Basic knowledge of organic and inorganic chemistry and microbiology as applied in a water or wastewater treatment laboratory			
2. Understand the basic physical properties of water and wastewater, and analytical methods to determine: color, turbidity, odor, alkalinity, hardness, conductivity, solids, temperature, pH, ammonia, anions			
3. Understand the basic chemical properties of water and wastewater and analytical methods to determine: dissolved oxygen, biochemical oxygen demand, chemical oxygen demand, chlorine residual (total and free)			
4. Understand the microbiological properties and methods for analysis of water and wastewater, such as: Coliform by multiple tube fermentation, Colilert knowledge for drinking water, Heterotrophic plate count (HPC), Enterococcus analysis			
5. Understand general microbiological concepts such as sterilization or aseptic technique, media preparation, different types of microorganisms			
6. Understand basic water and wastewater treatment processes			
7. Understand sample collection procedures			
8. Understand quality control terms and procedures, such as: method blanks, laboratory control samples, matrix spikes, sample replicates and duplicates, positive and negative controls, and count verifications			
Sub-Domain 1.2 – Testing			
1. Perform a variety of routine chemical, physical, and biological/microbiological tests of water, wastewater, solids, and soils in order to optimize treatment processes and ensure that plant processes meet regulatory requirements and process control requirements (e.g., National Pollutant Discharge Elimination System (NPDES) discharge permit standards, State and Federal health requirements for drinking water)			
2. Perform analytical tests and observations necessary to monitor the treatment process, including relating data to the plant operation			
3. Perform testing required for regulatory compliance and process control in accordance with laboratory standard operating procedures (SOPs), and produce work with precision and accuracy within SOP acceptance criteria			
Sub-Domain 1.3 – Analysis and Interpretation of Test Results and Data			

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1. Analyze wastewater and drinking water samples using a variety of chemistry wastewater and drinking water methodologies and instrumentation, such as: - Basic wet chemistry methods - Solids analysis - Chemical Oxygen Demand (COD) - Ammonia - Anions - Selective ion electrodes - pH - Alkalinity - Chlorine residual - Turbidity - Volatile acids			
2. Demonstrate basic knowledge of biological, microbiological, and bioassay wastewater and drinking water analytical methodologies, including: - Chronic and Acute Bioassays using live organisms (e.g., Ceriodaphnia dubia, various vertebrates) - Total and Fecal Coliform tests - Microbiological tests - Identification of microbial organisms			
3. Determine dissolved oxygen using a dissolved oxygen probe to determine biochemical oxygen demand			
4. Determine chlorine residual using a colorimeter and titration			
5. Knowledge of sound analytical techniques and principles of analytical chemistry and microbiology			
Sub-Domain 1.4 – Sample Collection			
1. Knowledge of water and wastewater sample collection and disposal procedures			
2. Collect water and wastewater samples from various locations in accordance with established laboratory procedures, including: - Chain of custody - Sample type (grab and composite) - Container type and preparation - Preservation - Hold time - Sampling techniques - Proper labeling - Storage condition			
3. Understand 24-hour sampling and operation of an autosampler			
4. Knowledge of appropriate use of glass and plastic containers, including preservation and washing methods			
How would you rank Domain 1 based on what you selected for each Sub-Domain?			
Domain 2 – Documentation, Quality Assurance/Control, and Ethics			

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Sub-Domain 2.1 – Records, Reporting, and Documentation			
1. Review and follow standard operating procedures (SOPs) and recommend modifications when appropriate			
2. Enter, maintain, and review data in the Laboratory Information Management System (LIMS)/electronic database to ensure accuracy			
3. Enter, review, and maintain bench records of all work performed, including for sampling, analysis procedures, and results			
4. Conduct and maintain records of results for quality control performed on media, standardized solutions, and reagents for microbiological, toxicity, and chemical analyses			
5. Provide technical support to lab management in the development of sampling programs and analytical techniques, and contribute feedback and suggestions to lab management as appropriate			
6. Prepare accurate reports of test results and statistical analyses			
7. Document and maintain accurate and complete laboratory records such as: routine documentation including worksheet/log sheet entries, sample documentation, and chain-of-custody			
8. Demonstrate basic knowledge of state and federal laws and regulations applicable to the work (e.g., Safe Drinking Water Act, National Pollutant Discharge Elimination System requirements, 40 CFR 136)			
Sub-Domain 2.2 – Quality Assurance and Quality Control			
1. Review and follow the Laboratory Quality Assurance Manual (QAM) and any quality assurance/quality control program criteria that the quality assurance program may require			
2. Conduct regular Method Detection Limit (MDL) Studies, Initial Demonstration of Capability (IDOC), and Ongoing Demonstration of Capability (ODOC) as required			
3. Communicate quality assurance concerns and exceedances, and document required corrective and preventive action steps taken			
4. Understand measurement traceability			
Sub-Domain 2.3 – Ethics			
1. Understand and practice proper laboratory ethics			
2. Report unethical behavior/practices such as improper data manipulations, adjustments of instrument time clocks, and inappropriate changes in concentrations of standards			
3. Understand direct chain of command			
4. Knowledge of the consequences of unethical behavior			
5. Knowledge of data integrity and legal defensibility			
How would you rank Domain 2 based on what you selected for each Sub-Domain?			
Domain 3 – Laboratory Equipment, Supplies, and Facilities			
Sub-Domain 3.1 – Operation, Maintenance, and Repair of Laboratory Equipment and Facilities			

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1. Perform routine and preventative maintenance and cleaning of lab equipment, fixtures, samplers, and glassware according to laboratory procedures			
2. Prepare, calibrate, standardize, and operate a variety of laboratory and operations equipment and instruments, such as: - Turbidity meters/turbidimeters - Dissolved oxygen meters - pH meters - Balances (analytical and top-loading) - Conductivity meters - UV-VIS spectrophotometers - Gravimetrics equipment - Columetric equipment - Sterilization equipment - Colorimeters - Thermometers			
3. Perform general laboratory housekeeping including cleaning			
Sub-Domain 3.2 – Preparing Solutions and Performing Dilution			
1. Prepare standard chemical solutions, reagents, stains, and media			
2. Understand how to make a dilution series and perform dilution of concentrated solutions			
3. Prepare filters and dishes for residue testing			
4. Knowledge of glass fiber filters, crucibles, sterilizations, and buffering solutions			
Sub-Domain 3.3 – Inventory and Ordering Supplies			
1. Assist in inventory control of supplies and chemicals			
2. Order laboratory supplies and document receipt			
3. Properly store chemicals and supplies, and track their expiration dates			
How would you rank Domain 3 based on what you selected for each Sub-Domain?			
Domain 4 – Safety			
Sub-Domain 4.1 – Laboratory Safety			
1. Recognize, correct, and report laboratory hazards and ensure work is performed in a safe manner consistent with safety policies and procedures			
2. Understand chemical handling and hygiene, storage, disposal, and spill response			
3. Understand engineering controls (fume hoods, etc.)			
4. Understand physical hazards (burns, sharps, compressed gas, electrical safety, fire, etc.)			
5. Knowledge of safety regarding handling and disposal of acids, bases, and solvents			

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6. Knowledge of safety regarding inhalation hazards			
7. Knowledge of the purpose and use of Personal Protective Equipment (PPE) and safety measures such as face shields, gloves, and emergency showers			
8. Review and follow the Laboratory Chemical Hygiene Plan (CHP)			
9. Assist in maintaining the laboratory safety data sheet (SDS) records; understand each section of SDSs and their relation to lab safety and right-to-know law			
10. Demonstrate safe practices when collecting field samples			
How would you rank Domain 4 based on what you selected for each Sub-Domain?			
Domain 5 – Math			
Sub-Domain 5.1 – Math			
1. Calculate test results (e.g., alkalinity, hardness, solids) according to industry standards and method requirements			
2. Perform unit conversions utilizing dimensional analysis			
3. Perform basic algebra (e.g., solve for an unknown)			
4. Demonstrate a basic understanding of statistics, including standard deviations, mean, median, and mode			
5. Calculate concentrations from a dilution series			
6. Demonstrate knowledge of scientific notation			
7. Demonstrate a basic understanding of how to calculate solution concentrations using concepts such as molarity and normality			
8. Understand significant figures and proper rounding			
9. Calculate percent recovery, relative percent difference (RPD), expected recoveries, and geometric mean			
How would you rank Domain 5 based on what you selected for each Sub-Domain?			

You may want to focus your studying in the areas where you selected "Limited Experience" or "Never Do This". See Laboratory Analyst Candidate Handbook.

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Laboratory Analyst Grade 2

In the rows below, select "Do It All The Time", "Limited Experience" or "Never Do This" based on your current knowledge and experience. Based on your responses, you can asses your overall preparedness for each Domain.

	Do It All The Time	Limited Experience	Never Do This
Domain 1 – Sample Collection, Testing, and Analysis			
Sub-Domain 1.1 – Water and Wastewater Laboratory Knowledge			
1. Proficient knowledge of organic and inorganic chemistry, biology, microbiology, and toxicity, as applied in a water or wastewater testing and treatment laboratory			
2. Understand general microbiological concepts such as sterilization or aseptic technique, media preparation, and good laboratory practices for minimizing cross-contamination			
3. Understand basic water and wastewater treatment processes			
Sub-Domain 1.2 – Testing, Analysis, and Interpretation of Results and Data			
1. Perform testing and analysis of samples using a variety of chemistry wastewater and drinking water methodologies and instrumentation, including: - Basic wet chemistry methods - Methods using Specific Ion Electrode Technologies (ammonia, pH) - Titrimetric Methods (alkalinity, hardness) - Acute and chronic toxicity - Colorimetric Methods (phosphorous, NO3/NO2) - Solids Methods (TSS, TS) - Dissolved oxygen - Chemical Oxygen Demand (COD) - Biochemical Oxygen Demand (BOD) Methods - Carbonaceous Biochemical Oxygen Demand (cBOD) Methods - TOC - Anions - Cyanide - Selective ion electrodes - Flow analyzers - Discrete analyzers - Ion Chromatography - Chlorine residual (total and free) - Turbidity - Volatile acids			

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2. Perform testing and analysis of samples using a variety of biological, microbiological, and bioassay wastewater and drinking water methodologies, including: - Chronic and Acute Bioassays using live organisms (e.g., Ceriodaphnia dubia, various vertebrae) - Total and Fecal Coliform tests - Coliform by multiple tube fermentation - Coliform by enzyme substrate test - Coliform by membrane filtration - Enterococcus enzyme substrate - Enterococcus by membrane filtration - Heterotrophic plate count (HPC) - Microbiological tests (MTF, MF) - Membrane filtration methods - Identification of microbial organisms			
3. Perform testing required for regulatory compliance and process control in accordance with laboratory standard operating procedures (SOPs), and produce work with precision and accuracy within SOP acceptance criteria			
4. Assist in the development of new or modified test procedures using standard reference materials			
5. Troubleshoot analytical procedures and instrumentation			
6. Recognize atypical data and apply appropriate corrections and notifications			
7. Set up and adjust testing schedules to meet changing conditions and emergencies			
8. Recognize when process control and regulatory compliance testing results are outside normal trending, and may indicate a change in the treatment process			
9. Communicate test results to internal clients and outside consultants or other parties as required			
Sub-Domain 1.3 – Sample Collection			
1. Knowledge of water and wastewater sample collection and disposal procedures			
2. Collect water and wastewater samples from various locations in accordance with established laboratory procedures, including: - Chain of custody - Sample type (grab and composite) - Container type and preparation - Preservation (pH adjustment) - Hold time - Sampling techniques - Proper labeling - Storage condition - Quality Control (sample validation/invalidation) - Ultra clean sampling methods - Autosampler maintenance and programming (flow-based or time based)			

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How would you rank Domain 1 based on what you selected for each Sub-Domain?			
Domain 2 – Documentation, Quality Assurance/Control, Regulatory Compliance, and Ethics			
Sub-Domain 2.1 – Records, Reporting, and Documentation			
1. Participate in the development, revision, and recommendation of modifications to policies and procedures			
2. Complete and maintain accurate physical and electronic records for all work performed, including sampling, analysis, equipment maintenance, and quality assurance/quality control tasks			
3. Enter, maintain, and review data in the Laboratory Information Management System (LIMS)/electronic database to ensure accuracy			
4. Conduct and maintain records of results for quality control performed on media, standardized solutions, and reagents for microbiological, toxicity, and chemical analyses			
5. Provide technical support for assessing and developing sampling programs and analytical techniques			
6. Prepare accurate reports of test results and statistical analyses			
7. Document and maintain accurate and complete laboratory records such as: routine documentation including worksheet/log sheet entries, sample documentation, chain-of-custody			
Sub-Domain 2.2 – Quality Assurance and Quality Control			
1. Conduct regular Method Detection Limit (MDL) Studies, and perform Initial and Ongoing Demonstration of Capability (IDOC & ODOC)			
2. Communicate quality assurance concerns and exceedances, and initiate required corrective and preventive action requirements			
3. Provide oversight and review of quality control data for the laboratory's operations, and report any quality control issues			
Sub-Domain 2.3 – Ethics			
1. Understand and practice proper laboratory ethics			
2. Report unethical behavior/practices such as improper data manipulations, adjustments of instrument time clocks, and inappropriate changes in concentrations of standards			
3. Understand direct chain of command			
4. Knowledge of the consequences of unethical behavior			
5. Knowledge of data integrity and legal defensibility			
Sub-Domain 2.4 – Regulatory Compliance			
1. Knowledge of regulatory compliance requirements for water and wastewater contained in NPDES permits, 40 CFR 136 and 141, and other regional, state and federal laws and regulations (e.g., Safe Water Drinking Act, OSHA (IIPP, ERP, CHP), etc.)			
2. Knowledge of reference method sources, such as Standard Methods and EPA			

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3. Knowledge of CA ELAP regulations and the TNI laboratory accreditation standard			
4. Participate in EPA and Environmental Laboratory Accreditation Program (ELAP) audits of the laboratory to maintain the laboratory's certification			
How would you rank Domain 2 based on what you selected for each Sub-Domain?			
Domain 3 – Laboratory Equipment, Supplies, and Facilities			
Sub-Domain 3.1 – Operation, Maintenance, and Repair of Laboratory Equipment and Facilities			
1. Perform routine and preventative maintenance and cleaning of lab equipment, fixtures, samplers, and glassware according to laboratory procedures			
2. Prepare, calibrate, standardize, operate, troubleshoot, and maintain a variety of laboratory and operations equipment and instruments, such as: - Turbidity meters/turbidimeters - Dissolved oxygen meters - pH meters - Balances (analytical and top-loading) - Conductivity meters - UV-VIS spectrophotometers - Microscopes - Autoclaves - Ovens - Incubators - Refrigerators - Water baths - Titrators - TOC - Continuous flow and discrete analyzers - Ion-specific electrodes			
3. Perform general laboratory housekeeping, including cleaning			
4. Utilize techniques and equipment used in laboratory analysis including: - Gravimetric (balance weighting) - Titrimetric/volumetric (burette, pipette, graduated cylinder, titrator) - Sterilization (autoclave, Bunsen burner, oven) - Colorimetric (visual observation, spectrophotometer/colorimeter) - Electrometric (meters, probes/electrodes, LDO, ISE) - Thermometers (ranges and max temp) - Sample preparation (digestion, extraction, filtration, distillation)			
Sub-Domain 3.2 – Preparing Solutions and Performing Dilution			
1. Prepare standard chemical solutions, reagents, stains, and media for various chemical and microbiological analyses			

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2. Understand how to make a dilution series and perform dilution of concentrated solutions			
3. Prepare filters and dishes for residue testing			
4. Prepare bacteriological culture media			
5. Knowledge of glass fiber filters, crucibles, sterilizations, and buffering solutions			
6. Verify prepared reagent quality (standardization)			
Sub-Domain 3.3 – Inventory and Ordering Supplies			
1. Assist in maintaining the supply inventory			
2. Assist laboratory staff in ordering supplies and document them upon receipt			
3. Assist laboratory staff in estimating laboratory supply and equipment needs			
4. Determine acceptability of reagents based on established policies and procedures and supplies			
5. Assist with vendor evaluations			
How would you rank Domain 3 based on what you selected for each Sub-Domain?			
Domain 4 – Safety			
Sub-Domain 4.1 – Laboratory Safety			
1. Recognize, correct, and report laboratory hazards and ensure work is performed in a safe manner consistent with safety policies and procedures			
2. Understand chemical handling and hygiene, storage, disposal, and spill response			
3. Understand biological hazards and hygiene, handling, storage, and disposal			
4. Understand engineering controls (fume hoods, etc.)			
5. Understand physical hazards (burns, sharps, compressed gas, electrical safety, fire, etc.)			
6. Knowledge of safety regarding handling and disposal of acids, bases, and solvents			
7. Knowledge of safety regarding inhalation hazards			
8. Familiarity with the purpose and use of Personal Protective Equipment (PPE) and safety measures such as face shields, gloves, and emergency showers			
9. Maintain laboratory safety data sheet (SDS) records and understand each section of SDSs and their relation to laboratory safety and right-to-know law			
How would you rank Domain 4 based on what you selected for each Sub-Domain?			
Domain 5 – Math			
Sub-Domain 5.1 – Math			
1. Calculate test results (e.g., alkalinity, hardness, solids) according to industry standards and method requirements			

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2. Perform unit conversions utilizing dimensional analysis			
3. Perform algebraic and statistical calculations			
4. Calculate concentrations from a dilution series			
5. Demonstrate knowledge of scientific notation			
6. Perform accurate calculations for solution preparation utilizing concepts such as dilution factors, molarity, normality, and standardization			
7. Understand significant figures and proper rounding			
8. Graph/generate standard curves and linear regressions			
9. Calculate percent recovery, relative percent difference (RPD), expected recoveries, and geometric mean			
How would you rank Domain 5 based on what you selected for each Sub-Domain?			

You may want to focus your studying in the areas where you selected "Limited Experience" or "Never Do This". See Laboratory Analyst Candidate Handbook.

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Laboratory Analyst Grade 3

In the rows below, select "Do It All The Time", "Limited Experience" or "Never Do This" based on your current knowledge and experience. Based on your responses, you can asses your overall preparedness for each Domain.

	Do It All The Time	Limited Experience	Never Do This
Domain 1 – Sample Collection, Testing, and Analysis			
Sub-Domain 1.1 – Water and Wastewater Laboratory Knowledge			
1. Advanced knowledge of organic and inorganic chemistry, biology, microbiology, and toxicity as applied in water or wastewater testing and treatment			
2. Functional knowledge of acute and chronic toxicity methods in water or wastewater			
3. Basic understanding of wastewater treatment processes and phases of the treatment process including effluent discharge and efficiency, activated sludge monitoring, treatment chemical doses			
4. Proficiency in wastewater treatment process control analyses including process control topics (MLSS/SVI, MCRT, F/M, chlorination (free and total), dechlorination, volatile acids/alkalinity ratio), microorganism speciation and counting, and digester sludge analysis			
5. Knowledge of which pollutants can be removed at each stage of treatment and which pollutants will remain in the final effluent			
6. Understand the chemical principles of methods/analysis, why some methods work better for certain matrices, and how and why interferences can be controlled (e.g., chlorine residual and cyanide)			
7. Understand how results are qualified and the relationships between various analytical techniques (BOD/COD/TOC, anion-cation balance)			
Sub-Domain 1.2 – Testing, Analysis, and Interpretation of Results and Data			

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1. Oversee and perform testing and analysis of samples using a variety of chemistry wastewater and drinking water methodologies and instrumentation, including: - Basic wet chemistry methods - Methods using Specific Ion Electrode Technologies (ammonia, pH) - Titrimetric Methods (alkalinity, hardness) - Acute and chronic toxicity - Colorimetric Methods (NO3/NO2) - Solids Methods (TSS, TS) - Dissolved oxygen - Chemical Oxygen Demand (COD) - Biochemical Oxygen Demand (BOD) Methods - Carbonaceous Biochemical Oxygen Demand (cBOD) Methods - Sulfide - Phosphorous methods (orthophosphate, total phosphorous) - Nitrogen methods (ammonia, nitrate, nitrite, Total Kjeldahl Nitrogen) - Major cations (Sodium, Calcium, Magnesium, Potassium) - Major anions (Sulfate, Chloride, Fluoride, Nitrate, Bicarbonate) - Cyanide - Selective ion electrodes - Flow analyzers - Discrete analyzers - Ion Chromatography - Chlorine residual (total and free) - Turbidity - Volatile acids			
2. Oversee and perform testing and analysis of samples using a variety of biological, microbiological, and bioassay wastewater and drinking water methodologies, including: - Chronic and Acute Bioassays using live organisms (e.g., Ceriodaphnia dubia, various vertebrae) - Total and Fecal Coliform tests - Coliform by multiple tube fermentation - Coliform by enzyme substrate test - Coliform by membrane filtration - Enterococcus enzyme substrate - Enterococcus by membrane filtration - Heterotrophic plate count (HPC) - Microbiological tests (MTF, MF) - Membrane filtration methods - Identification of microbial organisms			

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3. Interpret and evaluate data related to the physical properties, methods, and interferences for the analysis of water and wastewater: - Color - Turbidity - Odor - Alkalinity - Hardness - Conductivity - Solids - Temperature - pH - Acidity - Salinity - Oil and grease			
4. Possess proficient knowledge of: - Trace metals - Volatile Organic Compounds (VOC) - Semi-Volatile Organic Compounds (SVOC) - Pesticides - Organics - Total organic carbon (TOC) - Surfactants (MBAS) - Priority pollutants			
5. Oversee and perform National Pollutant Discharge Elimination System (NPDES) required methods, including advanced instrumental methods, and process control tests within acceptable precision and accuracy standards			
6. Assist in the development of new test procedures using standard reference materials			
7. Recognize when process control and regulatory compliance testing results are outside normal trending, and may indicate a change in the treatment process			
8. Communicate test results to internal clients and outside consultants or other parties as required			
9. Understand how to interpret inhibitory residue and water suitability tests results to verify water quality			
10. Recognize atypical data and apply appropriate corrections and notifications			
11. Establish, adjust, and troubleshoot testing schedules and analytical procedures to meet changing conditions and emergencies			
Sub-Domain 1.3 – Sample Collection			
1. Knowledge of water and wastewater sample collection and disposal procedures			

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2. Coordinate collection of water and wastewater samples from various locations in accordance with established laboratory procedures, including: - Chain of custody - Sample type (grab and composite) - Container type and preparation - Preservation (pH adjustment) - Holding time - Sampling techniques - Proper labeling - Storage condition - Sample location - Quality Control (sample validation/invalidation) - Ultra clean sampling methods - Autosampler maintenance and programming (flow-based or time based)			
How would you rank Domain 1 based on what you selected for each Sub-Domain?			
Domain 2 – Documentation, Compliance, Ethics, and Administration			
Sub-Domain 2.1 – Records, Reporting, and Documentation			
1. Document and maintain existing analytical standard operating procedures; develop, write, and review new analytical standard operating procedures, and recommend modifications as appropriate			
2. Manage, validate, and maintain accurate data in the Laboratory Information Management System (LIMS)/electronic database			
3. Complete and maintain accurate physical and electronic records for all work performed, including sampling, analysis, results, equipment maintenance, and quality assurance/quality control tasks			
4. Prepare and maintain accurate laboratory reports including, but not limited to, work performed, test results, special statistical analyses, chain-of-custody			
5. Knowledge of the reporting requirements of applicable regulatory permits for influent, effluent, biosolids, and receiving waters			
6. General awareness of SCADA			
Sub-Domain 2.2 – Laboratory Technical Support and Administration			
1. Provide technical support for assessing and developing sampling programs and analytical techniques			
2. Assist in implementation of regulations concerning water quality testing programs and ensure compliance			
3. Ability to conduct research projects			
4. Supervise, train, and evaluate the activities of staff and implement corrective actions as necessary			
5. Basic knowledge of pretreatment programs			

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6. Participate in the development and validation of methodology and reconfigure the Laboratory Information Management System (LIMS)/electronic database with the addition of new methods and/or changes to Quality Control			
7. Assist with the preparation of the laboratory budget and suggest capital improvements			
8. Monitor and track expenditures			
9. Identify resource needs and prepare detailed cost estimates with appropriate justifications			
10. Participate in vendor evaluations and contracting process			
Sub-Domain 2.3 – Quality Assurance and Quality Control			
1. Plan, implement, schedule, oversee, coordinate, and monitor the laboratory quality assurance program including quality assurance related activities			
2. Oversee regular QA/QC testing and studies, such as: – Method Detection Limit (MDL) Studies – Monitoring Initial and Continuing Demonstration of Capability (IDOC & CDOC) – Quality Control on media, standardized solutions, and reagents			
3. Communicate quality assurance concerns and exceedances, and initiate required corrective and preventive action requirements			
4. Regularly review Laboratory Information Management System (LIMS) data/electronic database, and document and communicate trends or exceedances			
5. Develop, maintain and interpret quality assurance/quality control program criteria			
6. Develop and review documents with regard to : - Control charts - Standards and reagents quality - Reagent water quality (inhibitory residue and water suitability), - Demonstration of Capability (DOC), - Instrument maintenance records - Documentation of corrective action - Analytical and microbiological data quality - Internal/external audits - Concept of equivalency testing/Alternative Test Protocol (ATP) - Correctness of analysis - Quality assurance plan - Equipment calibration and verification - Analytical and microbiological data quality			
7. Understand the use of laboratory control samples, method blanks, matrix spikes, and duplicates			
8. Schedule, implement, and report annual proficiency testing requirements for laboratory accreditation; address noncompliance issues with corrective action requirements			

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Sub-Domain 2.4 – Ethics			
1. Avoid and report ethics violations such as improper data manipulations, adjustments of instrument time clocks, and inappropriate changes in concentrations of standards			
2. Understand direct chain of command			
3. Understand the consequences of violations			
4. Knowledge of data integrity and legal defensibility			
5. Knowledge of the root causes of fraud and techniques to avoid or discourage fraud			
Sub-Domain 2.5 – Regulatory Compliance			
1. Participate in EPA and Environmental Laboratory Accreditation Program (ELAP) audits and activities to obtain and maintain accreditation			
2. Understand and comply with State and federal laws and regulations applicable to the work, including the Clean Water Act, Safe Drinking Water Act, National Pollutant Discharge Elimination System permit compliance and regulatory authority, OSHA (IIPP, ERP, CHP), NFPA, Method Update Rule, Hazardous waste program, 40 CFR 136 for analytical procedures			
3. Understand and participate in Discharge Monitoring Report - Quality Assurance (DMR-QA) reporting			
4. Understand TNI requirements to achieve ELAP Accreditation for the laboratory			
How would you rank Domain 2 based on what you selected for each Sub-Domain?			
Domain 3 – Laboratory Equipment, Supplies, and Facilities			
Sub-Domain 3.1 – Operation, Maintenance, and Repair of Laboratory Equipment and Facilities			
1. Oversee routine and preventative maintenance, repairs, and cleaning of lab equipment, fixtures, samplers, and glassware according to laboratory procedures			

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2. Prepare, calibrate, standardize, operate, troubleshoot, and maintain a variety of laboratory and operations equipment and instruments, such as: - Turbidity meters/turbidimeters - Dissolved oxygen meters - pH meters - Balances (analytical and top-loading) - Conductivity meters - UV-VIS spectrophotometers - Ion chromatographs - Microscopes - Autoclaves - Ovens - Incubators - Refrigerators - Water baths - Titrators - TOC - Continuous flow and discrete analyzers - Ion-specific electrodes			
3. Oversee general laboratory housekeeping, including cleaning			
4. Implement and evaluate techniques and equipment used in laboratory analysis including: - Gravimetric (balance weighting) - Titrimetric/volumetric (burette, pipette, graduated cylinder, titrator) - Sterilization (autoclave, Bunsen burner, oven) - Colorimetric (visual observation, spectrophotometer/colorimeter) - Electrometric (meters, probes/electrodes, LDO, ISE) - Turbidimetric (Nephelometer) - Thermometers (ranges and max temp) - Sample preparation (digestion, extraction, filtration, distillation) - Basic understanding of Ion chromatographs (GC, GC/MS, ICP-OES/MS, cold vapor AAS, HPLC)			
5. Knowledge of method detection limits (MDLs) and when they need to be updated			
Sub-Domain 3.2 – Preparing Solutions and Performing Dilution			
1. Prepare standard chemical solutions, reagents, stains, media, and samples for various chemical and microbiological analyses			
2. Understand how to make a dilution series and perform dilution of concentrated solutions			
3. Prepare filters and dishes for residue testing			
4. Knowledge of glass fiber filters, crucibles, sterilizations, and buffering solutions			
5. Create working standards from concentrated standards			

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6. Verify prepared reagent quality (standardization)			
7. Understand the concepts of molarity/normality and equivalence/valences			
8. Knowledge of atomic and molecular weights			
9. Standardize solutions using chemicals of known concentrations			
Sub-Domain 3.3 – Inventory and Ordering Supplies			
1. Maintain chemical inventory and assist in inventory control of supplies and chemicals			
2. Oversee the order, receipt, and documentation of laboratory supplies			
3. Estimate laboratory supply and equipment needs			
4. Per TNI, verify that supplies are acceptable to use in the lab by keeping track of approved vendors and the quality of product that has to be used			
How would you rank Domain 3 based on what you selected for each Sub-Domain?			
Domain 4 – Safety			
Sub-Domain 4.1 – Laboratory Safety			
1. Ensure work is performed in a safe manner consistent with safety policies and procedures; follow proper safety procedures, and recognize, correct, and report safety hazards			
2. Understand chemical handling and hygiene, storage, disposal, and spill response			
3. Understand biological hazards and hygiene, handling, storage, and disposal			
4. Understand engineering controls (fume hoods, etc.)			
5. Understand physical hazards (burns, sharps, compressed gas, electrical safety, fire, etc.)			
6. Understand inhalation hazards			
7. Select and use appropriate Personal Protective Equipment (PPE) and safety measures such as face shields, gloves, and emergency showers			
8. Develop, review, edit, and maintain the Laboratory Chemical Hygiene Plan (CHP)			
9. Maintain laboratory safety data sheet (SDS) records and understand each section of SDSs and their relation to laboratory safety and right-to-know law			
Understand confined space entry, including hazardous atmospheres and PPE necessary for entry			
How would you rank Domain 4 based on what you selected for each Sub-Domain?			
Domain 5 – Math			
Sub-Domain 5.1 – Math			
1. Calculate test results (e.g., alkalinity, hardness, solids) according to industry standards and method requirements			
2. Perform unit conversions utilizing dimensional analysis			

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3. Perform algebraic and statistical calculations, and be able to extrapolate data for a concentration-response relationship			
4. Calculate concentrations from a dilution series			
5. Familiarity with scientific notation			
6. Perform accurate calculations for solution preparation utilizing concepts such as dilution factors, molarity, and normality			
7. Perform temperature conversions between different temperature scales			
8. Calculate Biochemical Oxygen Demand (BOD)			
9. Graph/generate linear regressions, weighted linear regressions, quadratic regressions, and standard curves			
10. Calculate percent recoveries and expected recoveries			
How would you rank Domain 5 based on what you selected for each Sub-Domain?			

You may want to focus your studying in the areas where you selected "Limited Experience" or "Never Do This". See Laboratory Analyst Candidate Handbook.

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Laboratory Analyst Grade 4

In the rows below, select "Do It All The Time", "Limited Experience" or "Never Do This" based on your current knowledge and experience. Based on your responses, you can asses your overall preparedness for each Domain.

	Do It All The Time	Limited Experience	Never Do This
Domain 1 – Management and Administration			
Sub-Domain 1.1 – Management			
1. Manage, direct, control, and implement laboratory services conducting analysis of potable water, recycled water, and/or wastewater			
2. Develop laboratory goals, objectives, policies, and administrative systems of wastewater, drinking water, or recycled water testing and/or treatment facilities			
3. Represent agency and/or treatment plant in public and private meetings, seminars/workshops on matters relating to analytical procedures			
4. Act as liaison between laboratory and regulatory agencies			
5. Evaluate laboratory operations and activities and recommend improvements and modifications			
6. Coordinate laboratory services with other departments and agencies			
Sub-Domain 1.2 – Budgeting			
1. Oversee laboratory budget preparation, development, and administration			
2. Monitor and control laboratory budget and expenditures			
3. Assist with budget forecasts and justifications for capital improvements			
4. Develop budget forecasts and cost justifications for laboratory staffing needs			
5. Develop budget forecasts and cost justifications for laboratory equipment, materials, and supplies			
6. Establish and oversee contracts or agreements with contract laboratories and vendors			
Sub-Domain 1.3 – Supervision			
1. Supervise, plan, organize, direct, coordinate and review the work and activities of laboratory personnel			
2. Establish performance standards for laboratory personnel, conduct performance evaluations, implement discipline procedures and incentives			
3. Oversee, coordinate, and document staff professional development and training			
4. Participate in the recruitment, selection, and recommendation of the appointment of new staff			

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5. Monitor staff and address actions that may be improper, illegal or in violation of ethics policies or procedures			
6. Participate in employee development and advancement initiatives and succession planning			
How would you rank Domain 1 based on what you selected for each Sub-Domain?			
Domain 2 – Testing and Analysis			
Sub-Domain 2.1 – Interpretation and Evaluation			
1. Interpret and evaluate data related to the physical properties, methods, and interferences for the analysis of water and wastewater, such as: - Color - Turbidity - Odor - Alkalinity - Hardness - Conductivity - Solids - Temperature - pH - Acidity - Salinity - Oil and grease			
2. Apply advanced knowledge of the chemical properties, methods and interferences for the analysis of water and wastewater, such as: - Dissolved oxygen - Biochemical oxygen demand - Chemical oxygen demand - Chlorine residual (total and free) - Sulfide - Phosphorus methods (orthophosphate, total phosphorus) - Nitrogen methods (ammonia, nitrate, nitrite, Total Kjeldahl Nitrogen) - Major cations (Sodium, Calcium, Magnesium, Potassium) - Major anions (Sulfate, Chloride, Fluoride, Nitrate, Bicarbonate) - Cyanide			

3. Possess proficient knowledge of: - Trace metals - Volatile - Semi-volatile - Pesticides - Organics - Total organic carbon (TOC) - Surfactants (MBAS) - Priority pollutants - Radiochemistry - Emerging contaminants			
4. Interpret and evaluate data related to the microbiological properties, methods, and interferences for the analysis of water and wastewater, such as: - Coliform by multiple tube fermentation - Coliform by enzyme substrate test - Coliform by membrane filtration - Heterotrophic plate count (HPC) - Enterococcus analysis - Iterative methods			
5. Interpret evaluate and report acute and chronic toxicity data results including Toxicity Reduction Evaluation (TRE) and Toxicity Identification Evaluation (TIE)			
6. Knowledge of Whole Effluent Toxicity testing, including facilities and equipment, dilution water, effluent sampling methods, holding times, temperature, organism culturing and handling, data analysis, report preparation			
7. Interpret and evaluate laboratory data from contract laboratories			
Sub-Domain 2.2 – Procedures and Equipment			
1. Oversee and implement lab procedures and direct the collection of samples including: - Chain of custody - Sample type (grab and composite) - Container type and preparation - Preservation (pH adjustment) - Hold time - Sampling techniques - Proper labeling - Storage condition - Sample location - Quality Control (sample validation/invalidation) - Ultra clean sampling methods - Autosampler maintenance and programming (flow-based or time-based)			

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2. Oversee and direct operation and maintenance of test equipment including: - Turbidimeters - Dissolved oxygen meter - pH meters - Balances (analytical and top-loading) - Ion chromatographs - Conductivity meters - Microscopes, autoclaves - Ovens - Incubators - Refrigerators - Water baths - Titrators - Spectrophotometers - Gas Chromatography (GC) or Mass Spectrometry (GC/MS) analysis - Inductively coupled plasma mass spectrometry (ICP-MS) - Inductively coupled plasma - optical emission spectrometry (ICP-OES) analysis - Cold Vapor Atomic Absorption Spectroscopy (CVAAS) - HPLC - Reagent water purification system			
3. Oversee, maintain, calibrate, and monitor laboratory equipment used to ensure standardized chemical solutions and filtrates			
Sub-Domain 2.3 – Preparing Solutions and Performing Dilution			
1. Oversee the preparation of reagents, calibration and quality control standards and essential laboratory supplies			
2. Oversee the correct dilution of concentrated solutions			
3. Oversee the preparation of filters and dishes for residue testing			
4. Oversee the preparation of bacteriological culture media			
5. Advanced knowledge of glass fiber filters, crucibles, sterilizations, and buffering solutions			
6. Oversee the creation of working standards from concentrated standards			
7. Oversee the verification of prepared reagent quality (standardization)			
8. Understand the concepts of molarity/normality and equivalence/valences			
9. Advanced knowledge of atomic and molecular weights			
10. Direct the use of internal, external and second source QC standards			
Sub-Domain 2.4 – Analysis			

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1. Advanced knowledge of treatment process control analyses: - Process control topics (MLSS/SVI, MCRT, F/M, chlorination, dichlorination, volatile acids/alkalinity ratio) - Microorganism speciation and counting - Digester sludge analysis - Phases of the treatment process - Plant process efficiency			
2. Advanced knowledge of treatment processes including effluent discharge monitoring and process efficiency, activated sludge monitoring and chemicals used in treatment			
3. Apply lab results to plant processes and interpret plant performance			
4. Knowledge of drinking water disinfection and treatment processes in order to assist with troubleshooting water quality issues in drinking water (i.e., nitrification, blending calculations, positive coliform detections, surface water treatment, filtration technologies, etc.)			
Sub-Domain 2.5 – Research and New Method Development			
1. Investigate, plan, develop, and evaluate new laboratory techniques, analytical procedures, and instrumentation			
2. Evaluate and revise existing chemical test procedures			
3. Develop test methods			
How would you rank Domain 2 based on what you selected for each Sub-Domain?			
Domain 3 – Documentation, Compliance, and Ethics			
Sub-Domain 3.1 – Laboratory Records			
1. Manage, review, maintain, and archive accurate and complete laboratory records and reports, including: - Routine documentation, including worksheet/log sheet entries - Sample documentation - Chain-of-custody forms - Record data accurately - Report non-conforming data - Management of laboratory computerized database - Standard Operating Procedures (SOPs) - Method development and validation - Awareness of Process Operations SCADA - Data integrity and legal defensibility - Ethics training - Corrective actions - Equipment/Inventory list - Controlled documents list			
2. Expert knowledge in SOP development, including evaluating and revising SOPs to adhere to 2016 TNI Standard			

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3. Awareness of SCADA			
Sub-Domain 3.2 – Quality Assurance and Quality Control			
1. Direct, implement, and maintain the laboratory accreditation and quality assurance programs			
2. Read, analyze and interpret laboratory data effectively and correctly as applicable to regulations			
3. Review and update quality manual annually			
4. Oversee Initial and Continuing Demonstration of Capability (IDOC & CDOC) documentation			
5. Ensure internal audits are performed			
6. Conduct management review every 12 months			
Sub-Domain 3.3 – Regulatory Compliance			
1. Ensure adherence to government regulations, including: - EPA regulations as applied to laboratories (Clean Water Act, 40 CFR Part 136) - California Drinking Water Regulations (Title 22) - Safe Water Drinking Act - NPDES permit compliance and regulatory authority - OSHA (IIPP, ERP, HCP) - NFPA (chemical storage and labeling) - Method Update Rule - Laboratory accreditation (ELAP/TNI) - Hazardous waste program - CUPA - 503 Regulations Compliance - Indirect Potable Reuse Order Compliance			
2. Prepare and approve technical reports and correspondence on various matters as required by the National Pollution Discharge Elimination Systems (NPDES), Discharge Monitoring Report (DMR) permits, Division of Drinking Water (DDW) and Regional Water Quality Control Board (RWQCB), and Title 22 (California Laboratory Intake Portal Reports)			
3. Knowledge of Drinking Water regulations, such as MCLs, DLRs, notification limits, chlorine and chloramine disinfection, nitrate, treatment technologies (GAC, ion exchange, reverse osmosis), blending calculations, arsenic, PFAS, well operations, water quality issues specific to groundwater, surface water, and recycled water, lead and copper rule, water quality issues related to storage tanks			
4. Provide or ensure laboratory staff provide the required notifications for any analyzed constituent that exceeds regulatory standards within the required timeframe			
5. Knowledge of and ability to upload laboratory data into required electronic data portals			
Sub-Domain 3.4 – Ethics			
1. Oversee laboratory ethics training program			

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2. Oversee the avoidance, reporting, and corrective action of ethics violations such as improper data manipulations, adjustments of instrument time clocks, and inappropriate changes in concentrations of standards			
3. Understand the consequences of ethics violations			
4. Understand data integrity and legal defensibility			
5. Understand the root causes of fraud and techniques to avoid or discourage fraud			
6. Oversee, schedule, implement, and report annual performance testing monitoring requirements for laboratory accreditation; address noncompliance issues with corrective action requirements			
How would you rank Domain 3 based on what you selected for each Sub-Domain?			
Domain 4 – Safety			
Sub-Domain 4.1 – Hazards and Hygiene			
1. Understand biological and chemical hazards and hygiene (handling, storage, and disposal)			
2. Understand engineering controls (fume hoods, etc.)			
3. Understand physical hazards (burns, sharps, compressed gas, electrical safety, fire, ladder use, slip/trips/falls, etc.)			
4. Advanced knowledge of safety regarding inhalation hazards, including how to test and use a respirator			
5. Oversee and ensure the appropriate use of Personal Protective Equipment (PPE) and safety measures such as face shields, gloves, and emergency showers			
Sub-Domain 4.2 – Safety Management			
1. Direct implementation of corrective action for laboratory hazards			
2. Develop, review, revise, implement, and enforce the Laboratory Chemical Hygiene Plan (CHP)			
3. Oversee the maintenance of laboratory safety data sheet (SDS) records			
4. Ensure work is performed in a safe manner consistent with safety policies and procedures			
5. Understand field sampling hazards, including vehicle (driving) hazards, the recognition of confined-space entry hazards, manhole sampling and safety, etc.			
6. Knowledge of accident notification procedures and ability to deal with on-the-job injuries			
7. Oversee, coordinate, and document staff safety trainings			
How would you rank Domain 4 based on what you selected for each Sub-Domain?			
Domain 5 – Math			
Sub-Domain 5.1 – Statistics and Sampling			
1. Apply statistical methods used to analyze acute and chronic toxicity test data			
2. Analyze a variety of statistical data and/or information and make recommendations based on findings			

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3. Program a flow-based sampling schedule			
4. Calculate running annual averages (RAA), operational evaluation levels (OELs), and 90th percentiles			
Sub-Domain 5.2 – Calculations			
1. Ensure accurate calculations when preparing solutions (dilution factors, normality, molarity) and performing sample dilution			
2. Ensure accurate calculations were used when assessing the results from different parameters of a sample correlate			
3. Ensure accurate calculations were used when assessing quality control (recoveries, RPD) and control charting			
4. Ensure that method detection limit (MDL) calculations are accurate			
How would you rank Domain 5 based on what you selected for each Sub-Domain?			

You may want to focus your studying in the areas where you selected "Limited Experience" or "Never Do This". See Laboratory Analyst Candidate Handbook.