Applied Chemistry

Course Overview

This course is designed to acquaint students with the chemistry principles involved in water treatment, storage and distribution, and the math that applies to chemistry principles. Course material consists of reading assignments, video lectures, review questions, study problems and lesson quizzes.

Course completion requires that the student successfully complete each component of each individual lesson. Review questions and written assignments must be submitted either online or uploaded in a Word document for the professor's review. Lesson quizzes have a minimum passing score of 70%.

Upon successful completion of the course requirements, students will receive a certificate of completion for the *Applied Chemistry* course, which is applicable toward a Certificate in Water Treatment Technology from American Water College.

Applied Chemistry (2.9 CEUs)

- Operator Chemistry Made Easy
- The Structure of Matter
- The Classification of Matter
- Valence, Chemical Formulas, and Chemical Equations
- Solutions
- Acids, Bases, and Salts
- Chemistry of Treatment Processes
- Chemical Dosage Problems

Required Texts

Textbook: *Basic Science Concepts and Applications*, Principles and Practices of Water Supply Operations series
Edition: Fourth Edition
Author: Nicholas G. Pizzi
ISBN: 1-58321-778-9

Educational Objectives

- To provide students with an overview of the structure of matter
- To provide students with an overview of the classification of matter
- To acquaint students with chemical formulas and equations
- To provide students with an overview of solutions, calculating solutions and dilution calculations
- To acquaint students with acids, bases and salts
- To provide students with an overview of the chemistry of water treatment processes
- To acquaint students with chemical dosage problems and calculations

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Evaluation

Students will be graded on their performance on each lesson quiz, and their course participation. Unless each unit is completed, the student will not be permitted to advance to the next lesson, and the student will not be awarded credit for completion until all assignments, quizzes and lectures are completed. Please contact our office with any questions.

Support

Students can contact our student support staff with any course-related, content-related, or technology-related inquiries. Our office hours are Monday-Thursday, 9-5 CT, and Friday 9-12 CT.

Contact Info:

Phone Number: (661) 874-1655
Email Inquiries: Info@americanwatercollege.org

Additionally, students are encouraged to contact their professor directly with any questions or comments.

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Lesson 1 – The Structure of Matter

Summary of This Lesson

This lesson takes a detailed look at the basic structure of matter, how elements are represented in the periodic table, and why knowledge of the structure of elements is important in water system operations.

Lesson Objectives

Upon completion of this lesson, students will be able to:

- Explain the basic structure of matter
- Explain how elements are represented in the periodic table
- Explain why knowledge of the structure of elements is important in water system operations

Assignments for This Lesson

- Read Chemistry 1, "The Structure of Matter," in *Basic Science Concepts and Applications*
- Watch the video lecture for Lesson 1
- Answer Review Questions
- Complete the quiz for Lesson 1

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Lesson 2 – The Classification of Matter

Summary of This Lesson

Anything that has mass and occupies space is considered to be “matter”. Matter exists in three forms: solids, liquids, and gases.

This lesson takes a detailed look at how matter is classified into pure elements, compounds, and mixtures, it’s definition and examples of each classification, and why this is important in water system operations.

Lesson Objectives

Upon completion of this lesson, students will be able to:

- Explain how matter is classified into pure elements, compounds, and mixtures
- Explain the definition and examples of each classification
- Explain why this is important in water system operations

Assignments for This Lesson

- Read Chemistry 2, "The Classification of Matter," in *Basic Science Concepts and Applications*
- Watch the video lecture for Lesson 2
- Answer Review Questions
- Complete the quiz for Lesson 2

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Lesson 3 – Valence, Chemical Formulas and Chemical Equation

Summary of This Lesson

The electrons that are in the outer shell of an atom are called the valence electrons. These outer shell electrons are either shared between atoms or transferred from one to another during a chemical reaction.

This lesson takes a detailed look at the principles of valence, chemical formulas, chemical equations, the definitions of chemical terms, and why this is important in water system operations.

Lesson Objectives

Upon completion of this lesson, students will be able to:

- Explain the principles of valence, chemical formulas, and chemical equations
- Explain the definition of chemical terms
- Explain why this is important in water system operations

Assignments for This Lesson

- Read Chemistry 3, "Valence, Chemical Formulas, and Chemical Equations," in *Basic Science Concepts and Applications*
- Watch the video lecture for Lesson 3
- Answer Review Questions
- Complete the quiz for Lesson 3

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Lesson 4 – Solutions

Summary of This Lesson

There are two components that make up a solution: solvent and solute.

This lesson takes a detailed look at the principles of creating chemical solutions, how to calculate quantities of chemicals to use in making chemical solutions, and why chemical solutions are important in water system operations.

Lesson Objectives

Upon completion of this lesson, students will be able to:

- Explain the principles of creating chemical solutions
- Explain how to calculate quantities of chemicals to use in making chemical solutions
- Explain why chemical solutions are important in water system operations

Assignments for This Lesson

- Read Chemistry 4, "Solutions," in *Basic Science Concepts and Applications*
- Watch the video lecture for Lesson 4
- Answer Review Questions
- Complete the quiz for Lesson 4

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Lesson 5 – Acids, Bases and Salts

Summary of This Lesson

This lesson takes a detailed look at the meaning and significance of salts, pH, and alkalinity, and why these compounds and measurements are important in water system operations.

Lesson Objectives

Upon completion of this lesson, students will be able to:

- Explain the meaning and significance of salts, pH, and alkalinity
- Explain why these compounds and measurements are important in water system operations

Assignments for This Lesson

- Read Chemistry 5, "Acids, Bases and Salts," in *Basic Science Concepts and Applications*
- Watch the video lecture for Lesson 5
- Answer Review Questions
- Complete the quiz for Lesson 5

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Lesson 6 – Chemistry of Treatment Processes

Summary of This Lesson

This lesson covers the taste and odor removal processes, coagulation processes, iron and manganese removal processes, lime-soda ash softening processes, recarbonation processes, ion exchange softening processes, scale and corrosion control processes, and chlorination processes.

Lesson Objectives

Upon completion of this lesson, students will be able to:

- Explain the taste and odor removal processes
- Explain the coagulation processes
- Explain the iron and manganese removal processes
- Explain the lime-soda ash softening processes
- Explain the recarbonation processes
- Explain the ion exchange softening processes
- Explain the scale and corrosion control processes
- Explain the chlorination processes

Assignments for This Lesson

- Read Chemistry 6, "Chemistry of Treatment Processes," in *Basic Science Concepts and Applications*
- Watch the video lecture for Lesson 6
- Answer Review Questions
- Complete the quiz for Lesson 6

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Lesson 7 – Chemical Dosage Problems

Summary of This Lesson

This lesson covers mg/L to lb/day conversions, mg/L to percent conversions, feed rate conversions, chlorine dosage, demand, and residual calculations, percent strength calculations, lime-soda ash softening calculations, and fluoridation calculations.

Lesson Objectives

Upon completion of this lesson, students will be able to:

- Explain the mg/L to lb/day conversions
- Explain the mg/L to percent conversions
- Explain the feed rate conversions
- Explain the chlorine dosage, demand, and residual calculations
- Explain the percent strength calculations
- Explain the lime-soda ash softening calculations
- Explain the fluoridation calculations

Assignments for This Lesson

- Read Chemistry 7, "Chemical Dosage Problems," in *Basic Science Concepts and Applications*
- Watch the video lecture for Lesson 7
- Answer Review Questions
- Complete the quiz for Lesson 7