

OHLONE COLLEGE
Ohlone Community College District
OFFICIAL COURSE OUTLINE

I. Description of Course:

1. **Department/Course:** CHMT - 103A

2. **Title:** Chemical Technology I

3. **Cross Reference:**

4. **Units:** 4

Lec Hrs: 3

Lab Hrs: 3

5. **Repeatability:** No

6. **Grade Options:** Grade Only (GR)

7. **Degree/Applicability:**

Credit, Degree Applicable, Not Transferable (D)

8. **General Education:**

9. **Field Trips:** Required

10. **Requisites:**

Prerequisite

ENGL 151B Fundamentals of Composition and/or Writing skills are necessary for success in this course
MATH 151 Algebra I and/or Proficiency with basic algebra is necessary for success in this class.

12. Catalog Description:

A basic course that covers chemical principles, plus career and educational aspects of chemical technology. Topics will cover chemical nomenclature, atoms and molecules and their reactions, chemical and physical properties of materials, and chemical principles. In addition, students will get hands-on training in sample preparation, keeping lab notebooks, industry-based data processing, operation of basic lab equipment, and bioanalysis. This course will also cover employment opportunities, job functions, case studies of workplace activities with hands-on industry based labs.

13. Class Schedule Description:

Basic chemical principles with a focus on laboratory skills; includes career and industry exploration.

14. Counselor Information:

This course starts the student on one track of Molecular Sciences Technology; prepares student to work as a chemical lab tech.

II. Student Learning Outcomes

The student will:

1. Demonstrate mastery of knowledge of basic molecules and their reactions, chemical principles, and nomenclature.
2. Apply basic concepts of biotechnology and conduct bioanalysis at the basic level using a variety of instruments.
3. Handle and prepare samples with proper health, safety, and environmental considerations.
4. Use and maintain basic lab equipment such as pH meter, balances, glassware, autoclaves, ovens, and gas cylinders with regulated pressure valves; conduct basic glass fabrication and repair.

5. Demonstrate proper transfer techniques and weighing techniques with attention to accuracy and precision; make solutions; perform dilutions; perform calculations of concentration; calibrate volumetric glassware.
6. Present data using Excel; create best fit curves; manipulate slopes and other key features of graphs; apply mean, median, and standard deviation to the analysis of data.
7. Apply software applications to chemical analysis, including Word, ChemDraw, Data Studio, Odyssey Molecular Modeling, and Artificial Intelligence tutorial programs used in conjunction with "Mastering Chemistry" online homework.
8. Maintain a lab notebook; write industry style lab reports; demonstrate memo-style report writing and journal-style scientific writing.
9. Identify and describe the role of a Chemical Technician in the workplace.
10. Perform internet searches; explore case studies pertaining to aspects of the chemical industry.
11. Outline the development of a new chemical product, such as a pharmaceutical agent, from basic discovery to the marketplace.
12. Compile information regarding employment opportunities at local chemistry-based companies; identify key local industries.

III. **Course Outline:**

Role of Chemical Technician in the workplace

Typical facilities in which they work

Equipment and instrumentation they use

organizational structure of typical companies in the chemical industry and the functions served by the various employees

Chemical principles

Atoms, molecules, and their reactions

Types of bonding

Electron configuration and chemical periodicity

chemical principles and nomenclature

physical and chemical properties of atoms and molecules

classes of chemical reactions

acid/base

oxidation/reduction

combustion analysis

Stoichiometry

Identification of unknown by applying chemical and physical principles and basic separation techniques

Identifying cations and anions in solution

Properties of solutions

Units of concentration

Making aqueous solutions from dry reagent using volumetric flasks

Performing dilutions

Determination of density and specific gravity

Decanting and filtration

Diffusion

Osmosis

Sample Preparation

Handling/preparation of samples and reference standards

- Homogeneous and heterogeneous samples
- Representative and standard samples
- Lab skills and protocols
 - Glassware and vessels
 - Beakers
 - Test tubes
 - Crucibles
 - Evaporating dishes
 - Graduated cylinders
 - Volumetric flasks
 - Burets and titration apparatus
 - Standard laboratory equipment
 - Bunsen burners
 - Autoclaves
 - Ovens
 - Centrifuges
 - Instrumentation
 - Balances
 - pH meters
 - Spectrophotometers
 - Basic glass fabrication and repair
 - Calibration and Standardization
- Data Processing
 - Use of software
 - Word
 - Excel
 - ChemDraw
 - Data Studio
 - Graphical representation
 - Elementary statistics
 - Mean
 - Median
 - Standard deviation
 - Keeping a lab notebook
- Writing as per professional standards used in the scientific community
 - Industry-style lab reports
 - Memo-style reports
 - Journal-style reports
- Investigating processes in the chemical industry, eg. bringing new products from the chemical industry such as pharmaceutical agents into the economic pipeline

IV. **Course Assignments:**

A. Reading Assignments

1. Textbook
2. Handouts

B. Projects, Activities, and other Assignments

1. Field trips to chemical plants, pharmaceutical labs, government (air and water pollution) labs, etc. Students will report their observations and findings, including a discussion of the chemical processes.

C. Writing Assignments

1. Research paper on the development of a new drug produced by a pharmaceutical company or a chemical process formulated by a chemical company
2. "Pre-labs" -- written discussion and outline of the experiment to be done
3. Laboratory notebooks
4. Industry-style lab reports and memos, including graphical representations
5. Short explanations of chemical systems observed in the laboratory

V. **Methods of Evaluation/Assessment:**

A. 1. Objective tests

B. 2. Quizzes

C. 3. Final exam, which may include multiple choice, problem solving (quantitative and qualitative), writing equations, short-answer, and/or essay questions.

D. 4. Lab reports, which may include short answer, problem solving (qualitative and quantitative), writing balanced chemical equations and using these equations to answer questions. Writing must adhere to acceptable scientific standards.

E. 5. Written assignments: term paper, short essay, in-depth discussion/analysis in the lab notebook

F. 6. Oral assignments

G. 7. Problem solving

H. 8. Demonstration of the appropriate use of lab instrumentation

I. 9. Skills demonstration in lab employing critical thinking

J. 10. Class activities

VI. **Methods of Instruction:**

A. Discussion

B. Demonstration

C. Audiovisual

D. Computer Assisted Instruction

E. Lecture

F. Laboratory

G. Collaborative Learning

H. Other

1. Individual assistance

2. PowerPoint presentations enhanced by electronic notes made available to students online

3. Guest speakers from industry

4. Field trips to chemistry-based companies and government labs

VII. **Textbooks:**

Required

1. John Kenkel *A Primer on Quality in the Analytical Laboratory* most recent Edition, Lewis Publishers, 2000 ISBN: 1-56670-516-9
2. John Kenkel *Chemistry: An Industry-Based Laboratory Manual* most recent Edition, CRC Press, 2000 ISBN: 1-56670-346-8
3. John Kenkel *Analytical Chemistry for Technicians* 3rd Edition, CRC press, 2003 ISBN: 1-56670-519-3

Optional

VIII. Supplies:

- A. Goggles with indirect venting and side shielding
- B. Lab coat
- C. Lab gloves
- D. Lab notebook
- E. Scientific calculator

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