

# CHEM M12: INTRODUCTORY CHEMISTRY I

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**Originator**

csjoiner

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**College**

Moorpark College

**Attach Support Documentation (as needed)**

December\_2021\_C-ID\_Newsletter (4).pdf

Chem101.pdf

**Discipline (CB01A)**

CHEM - Chemistry

**Course Number (CB01B)**

M12

**Course Title (CB02)**

Introductory Chemistry I

**Banner/Short Title**

Introductory Chemistry I

**Credit Type**

Credit

**Start Term**

Fall 2022

**Catalog Course Description**

Introduces basic principles of chemistry with reference to measurement, chemical nature of matter and energy, and atomic theory. Presents the chemical concepts of elements and compounds, the periodic table, bonding, molecular structure, nomenclature, chemical reactions, equations, and calculations.

Course Credit Limitation: No credit if taken after CHEM M01A or CHEM M01AH.

**Taxonomy of Programs (TOP) Code (CB03)**

1905.00 - Chemistry, General

**Course Credit Status (CB04)**

D (Credit - Degree Applicable)

**Course Transfer Status (CB05) (select one only)**

A (Transferable to both UC and CSU)

**Course Basic Skills Status (CB08)**

N - The Course is Not a Basic Skills Course

**SAM Priority Code (CB09)**

E - Non-Occupational

**Course Cooperative Work Experience Education Status (CB10)**

N - Is Not Part of a Cooperative Work Experience Education Program

**Course Classification Status (CB11)**

Y - Credit Course

**Educational Assistance Class Instruction (Approved Special Class) (CB13)**

N - The Course is Not an Approved Special Class

**Course Prior to Transfer Level (CB21)**

Y - Not Applicable

**Course Noncredit Category (CB22)**

Y - Credit Course

**Funding Agency Category (CB23)**

Y - Not Applicable (Funding Not Used)

**Course Program Status (CB24)**

1 - Program Applicable

**General Education Status (CB25)**

Y - Not Applicable

**Support Course Status (CB26)**

N - Course is not a support course

**Field trips**

Will not be required

**Grading method**

(L) Letter Graded

**Alternate grading methods**

(O) Student Option- Letter/Pass

(P) Pass/No Pass Grading

**Does this course require an instructional materials fee?**

No

**Repeatable for Credit**

No

**Is this course part of a family?**

No

**Units and Hours**

**Carnegie Unit Override**

No

**In-Class**

**Lecture**

**Minimum Contact/In-Class Lecture Hours**

52.5

**Maximum Contact/In-Class Lecture Hours**

52.5

**Activity****Laboratory****Minimum Contact/In-Class Laboratory Hours**

52.5

**Maximum Contact/In-Class Laboratory Hours**

52.5

**Total in-Class****Total in-Class****Total Minimum Contact/In-Class Hours**

105

**Total Maximum Contact/In-Class Hours**

105

**Outside-of-Class****Internship/Cooperative Work Experience****Paid****Unpaid****Total Outside-of-Class****Total Outside-of-Class****Minimum Outside-of-Class Hours**

105

**Maximum Outside-of-Class Hours**

105

**Total Student Learning****Total Student Learning****Total Minimum Student Learning Hours**

210

**Total Maximum Student Learning Hours**

210

**Minimum Units (CB07)**

4

**Maximum Units (CB06)**

4

**Prerequisites**

MATH M01 or equivalent

**Entrance Skills****Entrance Skills**

MATH M01

**Prerequisite Course Objectives**

MATH M01-simplify and evaluate algebraic expressions.

MATH M01-identify a one variable equation as either conditional, a contradiction, or an identity and test numbers to determine if they satisfy the equation.

MATH M01-solve first-degree equations in one variable and check the solution for the given equation.

MATH M01-solve applied problems involving first-degree equations in one variable.

MATH M01-solve first-degree inequalities in one variable.

MATH M01-find the x- and y-intercepts of the graph of a linear equation.  
 MATH M01-find the slope of the line passing through two given points and determine the slope of a line given its graph.  
 MATH M01-graph a linear equation.  
 MATH M01-determine the slope and y-intercept of a line given its equation.  
 MATH M01-write an equation for a line given two points or given one point and the slope.  
 MATH M01-solve systems of two linear equations in two variables using each of the following methods: graphing method, addition (elimination) method, and the substitution method.  
 MATH M01-solve application problems by solving a system of two linear equations in two variables.  
 MATH M01-simplify expressions involving integer exponents using the properties and rules of exponents including the definitions of zero and negative exponents.  
 MATH M01-convert a number written in standard notation to scientific notation and vice-versa.  
 MATH M01-determine the degree of a polynomial and simplify, add, subtract, multiply, and divide polynomials.  
 MATH M01-solve quadratic equations by factoring.  
 MATH M01-simplify rational expressions to lowest terms and multiply, divide, add, and subtract rational expressions.

## Requisite Justification

### Requisite Type

Prerequisite

### Requisite

MATH M01 or equivalent

### Requisite Description

Course not in a sequence

### Level of Scrutiny/Justification

Required by 4 year institution

## Student Learning Outcomes (CSLOs)

**Upon satisfactory completion of the course, students will be able to:**

- |   |   |
|---|---|
| 1 | balance chemical reactions, interpret data, and solve various stoichiometry problems which include limiting reactant problems, generating correct answers with appropriate significant figures. |
| 2 | explain the results of their hands-on experiments using clear scientific language.  |
| 3 | record and handle measurements using correct scientific protocol, and how to organize their activity in a hands-on laboratory setting.  |
| 4 | demonstrate an understanding of how atomic theory allows chemists to explain the workings of the natural world.   |

## Course Objectives

**Upon satisfactory completion of the course, students will be able to:**

- |   |  |
|---|--|
| 1 | analyze and apply the scientific method to chemistry problems, including developing a hypothesis, hypothesis testing, evaluation, and modeling.  |
| 2 | list the basic units of measurement in the metric and English systems, perform unit conversions within and between systems, and express results appropriately with significant figures and in scientific notation.   |
| 3 | use dimensional analysis to perform mathematical conversions and solve problems involving density, energy, stoichiometry, quantum mechanics, solids, liquids, gases, and solutions.  |
| 4 | classify matter, distinguish between physical/chemical changes and properties, and comprehend the principles of chemical reactions and energy relationships.   |
| 5 | list and describe the distinguishing characteristics of solids, liquids, gases, and solutions.   |
| 6 | describe the quantum mechanical model and construct the historical development of the nuclear atom, explain the nature of atomic spectra, and account for trends in chemical periodicity involving atomic and ionic radii, ionization energy, and electronegativity. |
| 7 | identify the symbols of common elements, the structures of molecules and ions, and name various inorganic compounds.   |
| 8 | write balanced molecular, ionic, and net-ionic equations for synthesis, decomposition, combustion, single-replacement, double-replacement, and oxidation-reduction reactions.  |

9	apply Lewis and VSEPR (Valence Shell Electron Pair Repulsion) theories to draw structures and shapes, label electronic and molecular geometries, and predict polarities for molecules and ions.
10	state the general principles of Arrhenius and Bronsted-Lowry acid/base theories, explain the nature of the pH scale as well as perform pH calculations, and identify buffer solutions.
11	conduct various quantitative and qualitative hands-on experiments with adherence to safety protocols, record observations and express numerical values appropriately, analyze acquired data, and formulate proper conclusions through written expression of results.

## Course Content

### Lecture/Course Content

9% Measurements in Chemistry:

Measurement Systems

Uncertainty and Significant Figures

Scientific Notation

Conversion Factors and Dimensional Analysis

Density and Percent Concepts

7.00%

Matter and Energy:

Different States and Properties of Matter

Physical and Chemical Changes

Mixtures and Substances

Temperature Conversions

Conservation of Matter and Energy

6.00%

Chemical Nomenclature:

Classification of Compounds

Ionic Compounds

Binary Molecular Compounds

Binary Acids and Ternary Oxyacids

9.00%

Chemical Reactions:

Writing and Balancing Molecular Equations

Ionic and Net-Ionic Equations

Synthesis, Decomposition, Combustion, Double Displacements, and Oxidation-Reduction Reactions

12.00%

Stoichiometry:

Mole Concept and Avogadro's Number

Chemical Reactions and the Mole Concept

Limiting Reactant Yields

Percent Yield

Percent Composition

Empirical and Molecular Formulas

9.00%

Atomic Theory and Electronic Structure:

Dalton's Atomic Theory

Thomson and Rutherford Models of the Atom

Atomic Notation, Isotopes and Ions

Wave Nature of Light and the Bohr Model

Quantum Mechanical Model of the Atom

Electron Configurations

9.00%

Periodic Table:

Classification and Properties of Elements

Groups and Periods of Elements

Trends in Atomic and Ionic Radii

Trends in Ionization Energy

Trends in Electronegativity

9.00%

Chemical Bonding:

Ionic and Covalent Bonds

Lewis and VSEPR Theories

Bond and Molecular Polarity  
 Bond Strength and Bond Length  
 Resonance and Structural Isomers

9.00%

Gases:

Properties and Measurement of Gases  
 Gas Laws and Calculations  
 Ideal Gas Law and Stoichiometry  
 Dalton's Law of Partial Pressures  
 Kinetic Molecular Theory of Gases and Ideality

6.00%

Liquids and Solids:

Intermolecular Forces  
 Properties of Liquids and Solids  
 Changes of State and Dynamic Equilibrium  
 Structure and Properties of Water  
 A Closer Look at Hydrogen Bonding

9.00%

Solutions:

Solubility and the Dissolving Process,  
 Types of Solutions  
 Qualitative and Quantitative Concentration Units  
 Percent  
 Molarity  
 Dilutions  
 Solution Stoichiometry

6.00%

Acids and Bases:

Properties  
 Arrhenius and Bronsted-Lowry Theories  
 Ionization of Water  
 Concept of pH and Calculations  
 Indicators and Titrations  
 Strong and Weak Electrolytes  
 Buffer Solutions

### Laboratory or Activity Content

5.00% Safety in the chemistry laboratory

10.00% Measurements, use of hands-on chemistry laboratory equipment, and significant figures

10.00% Conservation of mass and percent composition of compounds

10.00% Empirical and molecular formulas

10.00% Quantitative and qualitative hands-on laboratory activities relating to properties of the states of matter (gases, liquids, solids, and solutions)

15.00% Molecular structure, naming, atomic spectroscopy, and the quantum mechanical model of the atom

20.00% Quantitative hands-on laboratory activities relating to stoichiometry

20.00% Hands-on reactions of aqueous ions, including acid/base reactions and double and single replacement reactions

### Methods of Evaluation

**Which of these methods will students use to demonstrate proficiency in the subject matter of this course? (Check all that apply):**

Written expression  
 Problem solving exercises  
 Skills demonstrations

**Methods of Evaluation may include, but are not limited to, the following typical classroom assessment techniques/required assignments (check as many as are deemed appropriate):**

Computational homework  
 Essay exams  
 Group projects  
 Individual projects  
 Journals  
 Laboratory activities  
 Laboratory practical examinations

Laboratory reports  
 Objective exams  
 Oral analysis/critiques  
 Oral presentations  
 Problem-solving exams  
 Problem-solving homework  
 Quizzes  
 Reports/papers  
 Research papers  
 Simulations  
 Skills demonstrations  
 Skills tests or practical examinations  
 Written analyses  
 Written homework  
 Classroom Discussion  
 Projects  
 Participation  
 Reports/Papers/Journals

## Instructional Methodology

### Specify the methods of instruction that may be employed in this course

Audio-visual presentations  
 Case studies  
 Class activities  
 Class discussions  
 Collaborative group work  
 Computer-aided presentations  
 Demonstrations  
 Dialog  
 Distance Education  
 Field trips  
 Group discussions  
 Guest speakers  
 Instructor-guided interpretation and analysis  
 Instructor-guided use of technology  
 Internet research  
 Laboratory activities  
 Large group activities  
 Lecture  
 Modeling  
 Observation  
 One-on-one conference  
 Oral Drills  
 Practica  
 Problem-solving examples  
 Readings  
 Small group activities  
 Web-based presentations

### Describe specific examples of the methods the instructor will use:

Chemical demonstrations performed by instructor.

Instructor will utilize a variety of instructional methods such as PowerPoint, whiteboard, and over-head projector to deliver lecture content.

Instructor will observe lab students to ensure proper hands-on data collection and analysis.

Instructor will demonstrate the use of Excel for graphing of data to determine trends.

## Representative Course Assignments

### Writing Assignments

written analysis of results from hands-on laboratory experiments on gas laws; such as, using the results of your experiment as a guide, write a few sentences explaining what would happen if the atmospheric pressure would be increased in the piston, and also a few sentences detailing what is happening to the molecules in the system. In other words, what does it 'look like' at a microscopic level when the pressure is increased?

written essay and short answer exam questions; such as, provide a short definition of the differences between an ionic bond, a polar covalent bond, and a covalent bond.

### Critical Thinking Assignments

describe and apply the series of steps for obtaining the solution to quantitative chemical problems.

analyze a set of data detailing chemical properties in order to deduce a set of rules that govern the behavior of this data. An example assignment would be: After examining a deck of cards with chemical names and formulas printed on them, determine which elements use Roman numerals in their names.

participate in a class discussion of example problems, homework, and problem solving sessions.

### Reading Assignments

research relevant background material related to a hands-on experiment performed in lab and use this to write an introduction to a laboratory report.

use the chemical literature to determine the expected density of a given substance and compare to the density obtained in lab.

### Skills Demonstrations

demonstrate proper use of glassware while measuring volumes and masses of various solid and liquid substances.

use a buret to determine the molarity of an unknown aqueous sodium hydroxide solution by titration.

## Outside Assignments

### Representative Outside Assignments

research the history and properties of an interesting molecule and prepare a PowerPoint presentation. A sample assignment would be: Every molecule has a history associated with its discovery, synthesis, effects on society and economic impact. You will prepare a five minute (around ten slides long) PowerPoint presentation on a molecule or an element that details what you've found interesting about this molecule or element.

complete homework problems from the textbook or from online homework system such as MasteringChemistry.

## Articulation

### C-ID Descriptor Number

CHEM 101

### Status

Approved

### Equivalent Courses at 4 year institutions

University	Course ID	Course Title	Units
CSU Channel Islands	CHEM 105	Introduction to Chemistry	3
CSU Chico	CHEM 107	General Chemistry for Applied Sciences	4
San Diego State Univ.	CHEM 100	Introduction to General Chemistry with Laboratory	4
CSU Northridge	CHEM 103 & 103L	Introductory Chemistry I and Lab	3 & 1

### Comparable Courses within the VCCCD

CHEM M12H - Honors: Introductory Chemistry I

CHEM R110 - Elementary Chemistry

CHEM V20 - Elementary Chemistry

CHEM V20L - Elementary Chemistry Laboratory

### Equivalent Courses at other CCCs

College	Course ID	Course Title	Units
LA Pierce College	CHEM 60	Introduction to General Chemistry	5

### Attach Syllabus

CHEM 12 Syllabus Spring 2022.doc



**District General Education****A. Natural Sciences****A2. Physical Science**

Approved

**B. Social and Behavioral Sciences****C. Humanities****D. Language and Rationality****E. Health and Physical Education/Kinesiology****F. Ethnic Studies/Gender Studies**

Course is CSU transferable

Yes

CSU Baccalaureate List effective term:

F1995

**CSU GE-Breadth****Area A: English Language Communication and Critical Thinking****Area B: Scientific Inquiry and Quantitative Reasoning****B1 Physical Science**

Approved

**B3 Laboratory Activity**

Approved

**Area C: Arts and Humanities****Area D: Social Sciences****Area E: Lifelong Learning and Self-Development****Area F: Ethnic Studies****CSU Graduation Requirement in U.S. History, Constitution and American Ideals:****UC TCA**

UC TCA

Approved

## IGETC

### Area 1: English Communication

### Area 2A: Mathematical Concepts & Quantitative Reasoning

### Area 3: Arts and Humanities

### Area 4: Social and Behavioral Sciences

### Area 5: Physical and Biological Sciences

#### Area 5A: Physical Science

Approved

#### Area 5C: Laboratory Science

Approved

### Area 6: Languages Other than English (LOTE)

## Textbooks and Lab Manuals

### Resource Type

Textbook

### Description

Tro, Nivaldo J. *Introductory Chemistry*. 6th ed., Pearson, 2017.

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### Resource Type

Textbook

### Description

Bishop, Mark. *An Introduction to Chemistry*. 2nd ed., Chiral Publishing Co, 2013, <https://preparatorychemistry.com/default.htm>. Accessed April 2022.

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### Resource Type

Textbook

### Description

Corwin, Charles. *Introductory Chemistry: Concepts and Critical Thinking*. 8th ed., Pearson, 2017.

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### Resource Type

Textbook

### Description

Moorpark College Chemistry Faculty. *Chemistry M12 Lab Manual*. V. 4.0, <https://www.moorparkcollege.edu/departments/academic/chemistry/chemistry-m12-laboratory-manual>. Accessed April 2022.

## Library Resources

### Assignments requiring library resources

Research using the library's print and online resources.

### Sufficient Library Resources exist

Yes

**Example of Assignments Requiring Library Resources**

Use the Library's print and online resources to research and report on relevant chemistry and background material in the introduction section of a written laboratory report about, for example, Boyle's Law.

**Distance Education Addendum****Definitions****Distance Education Modalities**

Hybrid (1%–50% online)

**Faculty Certifications**

Faculty assigned to teach Hybrid or Fully Online sections of this course will receive training in how to satisfy the Federal and state regulations governing regular effective/substantive contact for distance education. The training will include common elements in the district-supported learning management system (LMS), online teaching methods, regular effective/substantive contact, and best practices.

Yes

Faculty assigned to teach Hybrid or Fully Online sections of this course will meet with the EAC Alternate Media Specialist to ensure that the course content meets the required Federal and state accessibility standards for access by students with disabilities.

Common areas for discussion include accessibility of PDF files, images, captioning of videos, Power Point presentations, math and scientific notation, and ensuring the use of style mark-up in Word documents.

Yes

**Regular Effective/Substantive Contact****Hybrid (1%–50% online) Modality:**

Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	Students may be required to post their ideas or solutions for class-related material on the course discussion boards. Students may also be required to comment on the posts of other students, including constructive criticism.
E-mail	The instructor may email students with announcements about the course or other college events and opportunities and answer student questions. Students may email questions and possibly assignments or projects, depending on the nature of the class, directly to the instructor.
Face to Face (by student request; cannot be required)	Students may have the option to visit the instructor in their office on campus for office hours or to discuss other class-related items.
Other DE (e.g., recorded lectures)	The instructor may use other instruction methods appropriate to the subject matter. For example, pre-recorded lectures may be posted perhaps leading to a class discussion on the discussion boards.
Synchronous Dialog (e.g., online chat)	The instructor may hold class in a regular schedule but in an online format using a program such as ConferZoom. Office hours may also be held in this manner or with an online chat tool.
Telephone	Students may have the option to call the instructor and/or the instructor may call students to facilitate office hours or to discuss other class-related items.
Video Conferencing	The Instructor may hold class in a regular schedule but in an online format using a program such as ConferZoom. Office hours may also be held in this manner.

**Examinations****Hybrid (1%–50% online) Modality**

On campus

Online

**Primary Minimum Qualification**

CHEMISTRY

## Review and Approval Dates

**Department Chair**

03/25/2022

**Dean**

03/25/2022

**Technical Review**

04/21/2022

**Curriculum Committee**

05/04/2022

**DTRW-I**

MM/DD/YYYY

**Curriculum Committee**

MM/DD/YYYY

**Board**

MM/DD/YYYY

**CCCCO**

MM/DD/YYYY

**Control Number**

CCC000426607

**DOE/accreditation approval date**

MM/DD/YYYY