



COURSE OUTLINE : CHEM 101

D Credit – Degree Applicable

COURSE ID 004009

Cyclical Review: March 2021

COURSE DISCIPLINE : CHEM

COURSE NUMBER : 101

COURSE TITLE (FULL) : General Chemistry A

COURSE TITLE (SHORT) : General Chemistry A

CALIFORNIA STATE UNIVERSITY SYSTEM C-ID : CHEM 110 – General Chemistry for Science Majors I, with Lab

CCC ACADEMIC SENATE DISCIPLINE: Chemistry

CATALOG DESCRIPTION

CHEM 101 is the first course in a two-semester sequence which covers important chemistry concepts including physical properties of matter, chemical reactions, stoichiometry, electronic structure of atoms, quantum mechanics, chemical bonding, and the three phases of matter. Lecture and laboratory activities are integrated into one cohesive lecture-lab section. The latter part of the course covers solution chemistry with emphasis on chemical kinetics, thermodynamics, and electrochemistry. Laboratory activities supports the above-mentioned topics, including both qualitative and quantitative analysis of data and propagation of errors.

Total Lecture Units: 3.00

Total Laboratory Units: 2.00

Total Course Units: 5.00

Total Lecture Hours: 54.00

Total Laboratory Hours: 108.00

Total Laboratory Hours To Be Arranged: 0.00

Total Contact Hours: 162.00

Total Out-of-Class Hours: 108.00

Prerequisite: 1) ENGL 100 or ESL 141. 2) MATH 90, 90+, 90EF or high school algebra 2 with grade of "C" or better. 3) CHEM 110 or 1 year of laboratory-based high school chemistry with a grade of "C" or better and a satisfactory score on Chemistry Placement Exam.



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ENTRY STANDARDS

	Subject	Number	Title	Description	Include
1	ENGL	191	* Writing Workshop II	analyze short essays (approximately 2-6 paragraphs in length) to identify thesis, topic, developmental and concluding sentences, as well as transitional expressions used to increase coherence;	Yes
2	ENGL	191	* Writing Workshop II	evaluate compositions for unity, sufficiency of development, evidence, coherence, and variety of sentence structure;	Yes
3	ENGL	191	* Writing Workshop II	organize and write an essay which addresses the topic and is directed by a thesis statement;	Yes
4	ENGL	191	* Writing Workshop II	organize and write an essay which has an introduction, body, and conclusion and demonstrates a basic understanding of essay organization;	Yes
5	ENGL	191	* Writing Workshop II	organize and write an essay which shows some awareness of critical thinking and linkage of evidence with assertion;	Yes
6	ENGL	191	* Writing Workshop II	organize and write an essay which develops ideas, moving from general to specific;	Yes
7	ENGL	191	* Writing Workshop II	organize and write an essay which uses a variety of sentence types.	Yes
8	CHEM	110	Elements Of General Chemistry	evaluate current atomic theories;	Yes
9	CHEM	110	Elements Of General Chemistry	analyze experimental data;	Yes
10	CHEM	110	Elements Of General Chemistry	predict chemical properties;	Yes
11	CHEM	110	Elements Of General Chemistry	demonstrate proper use of laboratory equipment and chemicals.	Yes
12	MATH	90	Intermediate Algebra for BSTEM	Solve absolute value equations and inequalities;	Yes
13	MATH	90	Intermediate Algebra for BSTEM	solve linear equations and compound inequalities;	Yes
14	MATH	90	Intermediate Algebra for BSTEM	perform operations with polynomials;	Yes
15	MATH	90	Intermediate Algebra for BSTEM	simplify complex fractions;	Yes



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16	MATH	90	Intermediate Algebra for BSTEM	perform operations with radical expressions;	Yes
17	MATH	90	Intermediate Algebra for BSTEM	simplify expressions with rational exponents;	Yes
18	MATH	90	Intermediate Algebra for BSTEM	solve rational equations;	Yes
19	MATH	90	Intermediate Algebra for BSTEM	solve equations with radicals;	Yes
20	MATH	90	Intermediate Algebra for BSTEM	solve a system of linear equations using elimination substitution;	Yes
21	MATH	90	Intermediate Algebra for BSTEM	solve quadratic equations with real and complex solutions;	Yes
22	MATH	90	Intermediate Algebra for BSTEM	solve applied problems;	Yes
23	MATH	90	Intermediate Algebra for BSTEM	find the inverse of a function;	Yes
24	MATH	90	Intermediate Algebra for BSTEM	solve logarithmic and exponential equations;	Yes
25	MATH	90+	Intermediate Algebra for BSTEM with Support	Solve absolute value equations and inequalities;	Yes
26	MATH	90+	Intermediate Algebra for BSTEM with Support	solve linear equations and compound inequalities;	Yes
27	MATH	90+	Intermediate Algebra for BSTEM with Support	perform operations with polynomials;	Yes
28	MATH	90+	Intermediate Algebra for BSTEM with Support	simplify complex fractions;	Yes
29	MATH	90+	Intermediate Algebra for BSTEM with Support	perform operations with radical expressions;	Yes

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30	MATH	90+	Intermediate Algebra for BSTEM with Support	simplify expressions with rational exponents;	Yes
31	MATH	90+	Intermediate Algebra for BSTEM with Support	solve rational equations;	Yes
32	MATH	90+	Intermediate Algebra for BSTEM with Support	solve equations with radicals;	Yes
33	MATH	90+	Intermediate Algebra for BSTEM with Support	solve a system of linear equations using elimination, substitution;	Yes
34	MATH	90+	Intermediate Algebra for BSTEM with Support	find the composition of two functions;	Yes
35	MATH	90+	Intermediate Algebra for BSTEM with Support	solve applied problems;	Yes
36	MATH	90+	Intermediate Algebra for BSTEM with Support	solve quadratic equations with real and complex solutions;	Yes
37	MATH	90+	Intermediate Algebra for BSTEM with Support	solve logarithmic and exponential equations;	Yes

EXIT STANDARDS

- 1 evaluate past and present atomic theories with respect to experimental observations
- 2 describe chemical processes in terms of chemical equations and be able to use the equations to answer quantitative questions concerning the process described
- 3 describe the relationship between matter and energy and the inter-conversion of the two
- 4 analyze modern theories of atomic motion, especially as they apply to gasses
- 5 use quantum theory to predict electronic structures of the atom
- 6 analyze the properties of the elements and develop algorithms for the classification of the elements into logical groups
- 7 utilize bonding theories to describe the chemical nature of ions and molecules
- 8 demonstrate the proper use of laboratory equipment and the ability to handle chemicals safely
- 9 describe the scientific method and apply it to the development of the science of chemistry



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- 10 demonstrate an understanding of intermolecular forces and apply those forces to the nature of solids and liquids

STUDENT LEARNING OUTCOMES

- 1 design, construct, and interpret graphs accurately
- 2 solve quantitative chemistry problems and demonstrate reasoning clearly and completely as applied to stoichiometry and molarity, gas laws, and thermodynamics
- 3 write balanced general chemical and net ionic equations, classify types
- 4 perform laboratory experiments correctly using appropriate techniques and safety procedures
- 5 apply knowledge of the electronic structure of atoms to bonding, shape, and polarity
- 6 analyze experimental results, evaluate sources of error, and express results in clearly written laboratory reports
- 7 demonstrate reasoning in solving chemistry problems;
- 8 integrate multiple ideas in the problem solving process;
- 9 check results to make sure they are physically reasonable;
- 10 apply microscopic properties of matter to macroscopic processes;
- 11 use quantum theory to explain electronic structure of atoms;
- 12 use electronic properties to predict qualitative concepts and trends in the periodic table.

COURSE CONTENT WITH INSTRUCTIONAL HOURS

	Description	Lecture	Lab	Total Hours
1	Fundamental Definitions and Conversions of Units <ul style="list-style-type: none">• Matter and energy• Mass and weight• Properties of substances• Elements and compounds• SI and derived units• Temperature scales• Significant figures• Scientific notation• Factor-label method (or dimensional analysis) for problem solving	5.3	10.7	16



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2	<p>Atomic Structure</p> <ul style="list-style-type: none"> • Structure of the atom • Atomic mass, atomic number, isotopes • The mole • Chemical formulas • Empirical and molecular formulas • The laws of chemical combination • Properties of waves and light 	5.3	10.7	16
3	<p>Periodic Table</p> <ul style="list-style-type: none"> • Development • Relationship to electron configuration • Relationship to periodic properties • Relationship to chemical properties 	5.3	10.7	16
4	<p>Nomenclature</p> <ul style="list-style-type: none"> • Assigning oxidation numbers • Binary compounds • Acids 	5.3	10.7	16
5	<p>Stoichiometry</p> <ul style="list-style-type: none"> • Writing equations • Types of reactions • Stoichiometric calculations • Limiting reactants • Molarity • Acid/base titrations 	5.3	10.7	16
6	<p>Thermochemistry</p> <ul style="list-style-type: none"> • Definitions • Calorimetry • Energy changes in chemical reactions • Hess' Law • Enthalpies of solution 	5.3	10.7	16



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7	<p>Gases</p> <ul style="list-style-type: none"> • Pressure • Boyle's, Charles', and Avogadro's Laws • The Kinetic Molecular Theory • The ideal gas law • Stoichiometry involving gasses • Dalton's Law • Diffusion, effusion, and Graham's Law • Deviation from ideal behavior 	5.3	10.7	16
8	<p>Chemical Bonding</p> <ul style="list-style-type: none"> • Ionic compounds, Born-Haber Cycle, lattice energy • Lewis structures, the octet rule, formal charge • The covalent bond • Resonance • Bond energies • Molecular geometry: VSPER, VP and MO theories • Dipole moments 	5.3	10.7	16
9	<p>Liquids and Solids</p> <ul style="list-style-type: none"> • The hydrogen bond • Bonding in metals • Weak intermolecular forces • The liquid state • Crystal structure • Phase changes and phase diagrams 	11.6	22.4	34
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OUT OF CLASS ASSIGNMENTS

- 1 laboratory reports;
- 2 supplementary readings from handouts;
- 3 library research.

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- 1 four to six one-hour exams;
- 2 quizzes;
- 3 laboratory reports;
- 4 final exam with essay questions.

METHODS OF INSTRUCTION

- Lecture
- Laboratory
- Studio
- Discussion
- Multimedia
- Tutorial
- Independent Study
- Collaboratory Learning
- Demonstration
- Field Activities (Trips)
- Guest Speakers
- Presentations

TEXTBOOKS

Title	Type	Publisher	Edition	Medium	Author	ISBN	Date
Chemistry in the Laboratory	Required	W.H. Freeman	7	print	Postma, James M., et al.	1429219548	2013
Chemistry The Central Science	Required	Prentice Hall/Pearson,	11	print	Brown, T.E. and H. E. LeMay	0-13-600617-5	2009