CHEM 1210 Credits: 3

General Chemistry 1

This course emphasizes the general principles, theories, and concepts of inorganic chemistry for students in engineering, biology, environmental science, and related fields. Topics covered include: Units of Measurement, Matter and Energy, Atomic Theory, Stoichiometry, Chemical Reactions, The Periodic Table, Periodic Trends, Chemical Bonding, Nomenclature, and General Thermodynamics.

The course is offered in order to show students the usefulness of chemistry in their chosen field of study as well as in the world around them. The course also attempts to show not only that chemistry provides the basis for much that goes on in our world, but is a vital continually developing science. This exposure is designed to allow the student to obtain a sufficient mastery of these topics such that he/she can obtain the requisite knowledge and problem solving experience for a variety of upper level science and engineering courses.

Depending on the instructor, the course delivery system will incorporate a number of teaching strategies. Teaching methods may incorporate lectures, cooperative learning activities, group projects, library projects, case studies, classroom discussions, film and other media presentations, among others

Co-Requisites: CHEM1215 Modality: On Ground

Course Objectives Upon completion of this course, students will be able to
1. Demonstrate knowledge of basic chemistry principles.
2. Display understanding of advanced chemical principles including: Matter and Energy, Atomic Theory, Electronic Structure, Chemical Bonding, Chemical Reactions, Stoichiometry, Gas Laws, Solubility Rules, Nomenclature, Periodic Properties, Etc.
3. Utilize these scientific principles to solve a variety of problems relating to other fields of science such as physics, biology, engineering, and environmental science.

COURSE DETAILS:

This course in conjunction with CHEM 1215 Lab meets 7 periods per week in room 202/203.

INSTRUCTOR:

Mrs. Carrie Badger
Phone: 412-429-2500 x2202
Email: carrie.badger@carlynton.k12.pa.us

TEXTBOOK:

Principles of Chemistry: A Molecular Approach, 3rd Edition, By Nivaldo J. Tro Print ISBN: 978-0-321-97194-4

DEPARTMENTAL OR PROGRAM LEVEL ASSESSMENTS:

In order to meet various accreditation requirements for programs, schools or departments may require standardized tools to be used as part of the assessment for a course. Instructors are responsible for following the requirements set forth by the department head, dean, program director, coordinator or faculty representative.

CREDIT HOUR/CLOCK HOUR POLICY

RMU complies with Commonwealth of Pennsylvania and United States Department of Education regulations for determining the quantity of classroom instruction required to award credit for coursework, regardless of degree level, format, or mode of delivery. As such, RMU is in compliance for accreditation by the Middle States Commission on Higher Education (MSCHE).

Traditional or On-Ground fifteen (15) week Courses:

Credit Hour Equivalencies are met by scheduled class meetings and the scheduled final exam period.

TOPICAL OUTLINE

1. Matter and measurement
1.1 Types of Matter
1.2 Measurements
1.3 Properties of Substances
1.4 Solving Chemical Problems using equations and conversions of units

2. Atoms, molecules and ions
2.1 Atoms and Atomic Theory
2.2. Components of the Atoms
2.3 Introduction to the Periodic Table
2.4 Molecules and Ions
2.5 Formulas of Ionic Compounds
2.6 Names of Compounds

3. Molecules and Compounds
3.1 Hydrogen, Oxygen, and Water
3.2 Chemical Bonds
3.3 Representing Compounds: Chemical Formulas and Molecular Models
3.4 An Atomic-Level View of Elements and Compounds
3.5 Ionic Compounds: Formulas and Names
3.6 Molecular Compounds: Formulas and Names
3.7 Summary of Inorganic Nomenclature
3.8 Formula Mass and the Mole Concept for Compounds
3.9 Composition of Compounds
3.10 Determining a Chemical Formula from Experimental Data
3.11 Organic Compounds

5 Gases
5.1 Breathing: Putting Pressure to Work
4.2 Pressure: The Result of Molecular Collisions
5.3 The Simple Gas Laws: Boyle's Law, Charles's Law, and Avogadro's Law
5.4 The Ideal Gas Law
5.5 Applications of the Ideal Gas Law: Molar Volume, Density, and Molecular Mass of a Gas
5.6 Mixtures of Gases and Partial Pressures
5.7 Gases in Chemical Reactions: Stoichiometry Revisited: Molar Volume
5.8 Kinetic Molecular Theory: A Model for Gases
5.9 Diffusion and Effusion of Gases
5.10 Real Gases: The effects of Size and Intermolecular Forces

4. Chemical Reactions and Chemical Quantities
4.1 Climate Change and the Combustion of Fossil Fuels
4.2 Reaction Stoichiometry: How Much Carbon Dioxide?

TOPICAL OUTLINE

4.3 Limiting Reactant, Theoretical Yield, and Percent Yield
4.4 Solution Concentration and Solution Stoichiometry 4.5 Types of Aqueous Solution and Solubility
4.6 Precipitation Reactions: Writing and Balancing Chemical Equations
4.7 Representing Aqueous Reactions: Molecular, Ionic, and Complete Ionic Equations
4.8 Acid Base and Gas Evolution Reactions
4.9 Oxidation-Reduction Reactions

18. Electrochemistry
18.1 Pulling the Plug on the Power Grid
18.1 Balancing Oxidation-Reduction Equations
18.3 Voltaic (or Galvanic) Cells: Generating Electricity from Spontaneous Chemical Reactions
18.4 Standard Electrode Potentials

6 Thermochemistry
6.1 Chemical Hand Warmers
6.2 The Nature of Energy: Key Definitions
6.3 The First Law of Thermodynamics: There Is No Free Lunch
6.4 Quantifying Heat and Work
6.5 Measuring ΔE for Chemical Reactions: Constant-Volume Calorimetry
6.6 Enthalpy: The Heat Evolved in a Chemical Reaction at Constant Pressure
6.7 Constant-Pressure Calorimetry: Measuring ΔHrxn
6.8 Relationships Involving ΔHrxn
6.9 Determining Enthalpies of Reaction from Standard Enthalpies of Formation

7 The Quantum-Mechanical Model of the Atom
7.1 Schrodinger's Cat
7.2 The Nature of Light
7.3 Atomic Spectroscopy and the Bohr Model
7.4 The Wave Nature of Matter: The de Broglie Wavelength, the Uncertainty Principle, and Indetermina 8.5 Quantum Mechanics and the Atom
7.6 The Shapes of Atomic Orbitals

8Periodic Properties of the Elements
8.2 The Development of the Periodic Table
8.3 Electron Configurations:
8.5 The Explanatory Power of the Quantum-Mechanical Model
8.6 Periodic Trends in the Size of Atoms and Effective Nuclear Charge
8.7 Ions: Electron Configurations, Magnetic Properties, Ionic Radii, and Ionization Energy
8.8 Electron Affinities and Metallic Character

9. Chemical Bonding I: The Lewis Model
9.2 Types of Chemical Bonds

TOPICAL OUTLINE

9.3 Representing Valence Electrons with Dots
9.4 Ionic Bonding: Lewis Symbols and Lattice Energies
9.5 Covalent Bonding: Lewis Structures 9.6 Electronegativity and Bond Polarity
9.7 Lewis Structures of Molecular Compounds and Polyatomic Ions
9.8 Resonance and Formal Charge
9.9 Exceptions to the Octet Rule: Odd-Electron Species, Incomplete Octets, and Expanded Octets 10.10 Bond Energies and Bond Lengths

10. Chemical Bonding II:
10.2 VSEPR Theory: The Five Basic Shapes
10.3 VSEPR Theory: The Effect of Lone Pairs
10.4 VSEPR Theory: Predicting Molecular Geometries
10.5 Molecular Shape and Polarity

EXAMINATION SCHEDULE:

There is a comprehensive exam at the end of each chapter. The exam consists of multiple choice, short answer, problem solving and application problems.

RMU GRADING SCALE:

93-100	A
90-92	A-
87-89	B+
83-86	B
80-82	B-
77-79	C+
70-76	C
60-69	D
<60	F

GENERAL INFORMATION:

The schedule and procedures in this course are subject to changes by the instructor which will be announced in class, via your official school email account or in Google Classroom.

CLASS PARTICIPATION:

Attendance in each scheduled class is strongly advised. As it is a requirement of the university, attendance will be taken at each class session. It is the policy of this department that if a student misses more than 25% of the classes, he/she will automatically receive an “F” grade. Changes in the class schedule, information on coursework, exams and other notices will usually be given in class. It is your responsibility to keep up-to-date with these changes.

Office hours will provide opportunities for students to ask questions, get clarification on lectures, class notes, or other related tasks. Office hours will also be used to learn how to solve problems and take deeper dives into the material. Office hours are intended to reinforce your knowledge of topics/concepts rather than a class to reteach a concept/topic. When warranted, you are expected to make use of office hours provided by your instructor.

MISSED EXAMS OR ASSIGNMENTS:

Be responsible for you own education. If you miss a quiz or exam there may be no opportunity to make up the assignment depending on the schedule of the course. Your instructor reserves the right not to grant due date extensions for assignments. Your instructor reserves the right to deduct points for assignments that are turned in late. Under no circumstances will late homework be accepted once the instructor has returned the graded homework to the class. Your instructor reserves the right not to grade bonus questions for assignments turned in late. If you miss a class, you must be able to confirm your excuse with legitimate documented evidence. Ask questions and get involved in class discussions. Your participation and willingness to learn may be used as an additional grade determination in borderline situations. For face-to-face classes, hardcopies of worksheets and homework assignments which are to be completed by the student and returned to the instructor should be submitted in class. When specified by your instructor, some assignments will be submitted through Google Classroom.

CLASSROOM ETIQUETTE:

Be on time and remain for the entire period. Arriving late and/or leaving early is inconsiderate of your colleagues. Please ask questions or make comments that will benefit the entire class, but save your private conversations for another time. You may not realize how disturbing your "private" conversations are when others are trying to listen to a lecture. Students should refrain from other activities which can be distracting either to the instructor or to other students. Put your cell phones, iPods, and other personal electronic devices away and refrain from using them during class. Sending and receiving of phone calls AND TEXT MESSAGES is inappropriate in class and will not be tolerated.

ACADEMIC INTEGRITY POLICY:

Academic Integrity is valued at Robert Morris University. All students are expected to understand and adhere to the standards of Academic Integrity as stated in the RMU Academic Integrity Policy, which can be found on the RMU website at www.rmu.edu. Any student who violates the Academic Integrity Policy is subject to possible judicial proceedings which may result in sanctions as outlined in the Policy. Depending upon the severity of the violation, sanctions may range from receiving a zero on an assignment to being dismissed from the university. If you have any questions about the policy, please consult your course instructor.

Copying material from any location (including the internet) and submitting it as your own work is unacceptable. This is viewed as plagiarism and will result in no credit for the assignment. It is encouraged that students form study groups and work together to understand the course material, but each student is responsible for doing his/her own work. Copying work from another student is viewed as plagiarism, does not display the required understanding of the material, and will result in no credit for the assignment. If you are unfamiliar with the definition of plagiarism, refer to the RMU academic integrity webpage (http://academicaffairs.rmu.edu/academic-integrity) and to any number of excellent online sources:

Students may not collaborate with any other individuals on work turned in for this course, except when such collaboration is explicitly permitted by the instructor. This policy applies specifically but not exclusively to homework and worksheets. While students may work together in study groups in order to enhance their understanding of the course material, copying another student's homework or worksheet answers constitutes cheating. Students may not turn in work for credit in this course that has also been turned in for credit in another course, or work that substantially consists of material turned in for credit in another course. As a student and as a member of the scientific community, you have an ethical and legal obligation to practice proper writing techniques which include citation of sources and proper referencing of materials used. RMU in general and your instructor specifically has no tolerance for copying and

plagiarism. There is no excuse for either in any case. When in doubt, submit your assignment to your instructor early for review. Receipt of this syllabus and your continued enrollment in this class constitutes an agreement to follow the academic integrity policy.

The instructor reserves the right to utilize any technology or mechanism to ensure that students comply with academic integrity. Software filtering programs may be used to review any submissions during the semester. During exams students may be segregated, sequestered or provided with unique exams to help ensure academic integrity. Student exams and quizzes may be compared to help identify the sharing of information

Should a student be found guilty of a Major Violation through the Robert Morris University, Academic Integrity Committee process, the student will receive a final letter grade of an "F" for the course.

ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES:

Robert Morris University welcomes students with disabilities into all of the University's educational programs. If you have (or think you may have) a disability that would impact your educational experience in this class, please contact your instructor to ensure they have an up-to-date copy of your IEP/504 or you can reach out to Pupil Personnel for additional assistance.

FERPA - FAMILY EDUCATIONAL RIGHTS AND PRIVACY ACT:

The Family Educational Rights and Privacy Act (FERPA) (20 U.S.C. § 1232g; 34 CFR Part 99) is a Federal law that protects the privacy of student education records. FERPA gives parents certain rights with respect to their children's education records. These rights transfer to the student when he or she reaches the age of 18 or attends a school beyond the high school level. Students to whom the rights have transferred are "eligible students".
To find out more about how the law affect you please visit:
http://www.ed.gov/policy/gen/guid/fpco/ferpa/index.html

UNDERGRADUATE COURSE REPETITION:

Per the University's Undergraduate Repeating Courses Policy (please refer to the official ACADEMIC POLICIES webpage which can be found on the RMU website at www.rmu.edu):
A student may repeat a course in which a grade of D, F, N, or L was received. Students must repeat courses even if a passing grade was earned if a particular course requires a higher minimum grade.
If the student receives a lower grade after repeating a course, the student's cumulative quality-point average will be based on the most recent grade earned.
Students who have not attained the minimum passing grade for courses required in their program of study after three attempts (or other program requirements) may be dismissed from the program.

SYLLABUS CHANGES:

The standards and requirements set forth in this syllabus may be modified at any time by the course instructor. Notice of such changes will be by announcement in class or by written notice via email or the course Google Classroom.

CHEM1210 - General Chemistry 1

This course emphasizes the general principles, theories, and concepts of inorganic chemistry for students in engineering, biology, environmental science, and related fields. Topics covered include: Units of Measurement, Matter and Energy, Atomic Theory, Stoichiometry, Chemical Reactions, The Periodic Table, Periodic Trends, Chemical Bonding, Nomenclature, and General Thermodynamics.
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Depending on the instructor, the course delivery system will incorporate a number of teaching strategies. Teaching methods may incorporate lectures, cooperative learning activities, group projects, library projects, case studies, classroom discussions, film and other media presentations, among others

Pre-Requisites: Co-Requisites: CHEM 1215 Credits: 3 15 Week Comm Skills

Program Objectives for: **Biology**	
Produce graduates that are:	
1. Knowledgeable in biological science subject matter and processes.	PO1
2. Competitive for employment, graduate and professional schools.	PO2
3. Able to interpret, analyze, evaluate, and construct arguments on a scientific topic.	PO3
4. Able to effectively communicate scientifically.	PO4
5. Experienced with scientific technical skills, methodology, real world problems and situations.	PO5

Course Objectives	Program Objectives
Upon completion of this course, students will be able to	
1. Demonstrate knowledge of basic chemistry principles	PO1, PO2, PO5
2. Display understanding of advanced chemical principles including: Matter and Energy, Atomic Theory, Electronic Structure, Chemical Bonding, Chemical Reactions, Stoichiometry, Gas Laws, Solubility Rules, Nomenclature, Periodic Properties, Etc.	PO1, PO2, PO3, PO4, PO5
3. Utilize these scientific principles to solve a variety of problems relating to other fields of science such as physics, biology, engineering, and environmental science.	PO1, PO2, PO3, PO5

CHEM1210 - General Chemistry 1

This course emphasizes the general principles, theories, and concepts of inorganic chemistry for students in engineering, biology, environmental science, and related fields. Topics covered include: Units of Measurement, Matter and Energy, Atomic Theory, Stoichiometry, Chemical Reactions, The Periodic Table, Periodic Trends, Chemical Bonding, Nomenclature, and General Thermodynamics.
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Depending on the instructor, the course delivery system will incorporate a number of teaching strategies. Teaching methods may incorporate lectures, cooperative learning activities, group projects, library projects, case studies, classroom discussions, film and other media presentations, among others

Pre-Requisites: Co-Requisites: CHEM 1215 Credits: 3 15 Week Comm Skills

Program Objectives for: Chemistry Minor	
Students completing the chemistry minor will:	
1. Understand chemistry subject matter and processes and be able to interpret analyze, evaluate, and construct arguments on a scientific topic	PO1
2. Be experienced with scientific technical skills, methodology, real world problems and situations specifically within the chemistry discipline.	PO2
3. Be able to effectively communicate using scientific terminology and nomenclature	PO3

Course Objectives	Program Objectives
Upon completion of this course, students will be able to	
1. Demonstrate knowledge of basic chemistry principles	PO1
2. Display understanding of advanced chemical principles including: Matter and Energy, Atomic Theory, Electronic Structure, Chemical Bonding, Chemical Reactions, Stoichiometry, Gas Laws, Solubility Rules, Nomenclature, Periodic Properties, Etc.	PO1, PO2, PO3
3. Utilize these scientific principles to solve a variety of problems relating to other fields of science such as physics, biology, engineering, and environmental science.	PO1, PO2, PO3