

Chemistry

Cornerstone Tutorial

Course Description: This college-prep chemistry course is designed for the student who has completed algebra and has had an introduction to biology and physical science. It provides a detailed introduction to the methods and concepts of general chemistry. Successful completion of the course requires strong math skills, good study habits, safe and detailed laboratory work, and willingness to work hard.

Course Objectives-

- Make metric measurements and manipulate measurements and units in laboratory exercises and application problems
- Develop logic skills and methods of problem solving for application problems using math
- Explain the importance of measurement and units in science
- Learn and apply safe practices in the laboratory
- Make observations during experiments and record them
- Draw conclusions from experimental observations and relate to scientific laws and theories
- Describe the properties of matter: elements, compounds, mixtures, atoms, molecules, metals, semi-metals & non-metals
- Describe and calculate the properties and transfer of energy in chemical systems, especially electricity, heat and light
- Describe the structure of atoms including electron configurations
- Describe the structure of molecules, including shape
- Describe the structure of the periodic table and use it to determine properties of elements
- Calculate, using moles, to determine the amounts of reactant or product in a chemical reaction
- Describe the different types of chemical reactions and predict their products
- Write formulas for and name chemical compounds
- Identify chemical and physical changes in matter
- Use the Kinetic Molecular theory of matter to describe properties of solids, liquids, and gases
- Describe the properties of acids and bases and study their reactions
- Describe the factors that affect the speed of a reaction and use rate laws to calculate speeds of reactions
- Define and explain chemical equilibrium
- Describe how reduction-oxidation reactions take place and their usefulness

How the Course will be taught from a Christian Worldview:

Students will learn that science is the study of how God structured creation and the laws and forces He uses to uphold His creation. As a class we will examine the logic and order of creation, with a focus on the physical world including atomic and subatomic structure, physical and chemical change, chemical reactions, and energy transfer within chemical systems. Students will also relate their knowledge to everyday applications of chemistry concepts. Overall, we will seek to understand more of God's character as revealed in creation and our relationship to creation.

Content: Materials used are listed in the table below.

#	Material	Used by Student	Used by Teacher
1	<i>Exploring Creation with Chemistry</i> , 2nd Edition	Yes	Yes
2	Solutions Manual for <i>Exploring Creation with Chemistry</i>	Yes	Yes
3	<i>Exploring Creation with Chemistry</i> CD-ROM	Optional	Yes
4	Possible excerpts from the "Great Books" for scientists such as Faraday, etc...	Yes, teacher will provide	Yes
5	Laboratory Notebook: Bound graphpaper notebook	Yes	Yes

Grading system per quarter:

Percent grades will be scored from zero to 100. Parents will assign the final class grade.

- Weekly homework 20 %
- Laboratory Notebook (containing all lab write-ups) 25 %
- Module Tests 25 %
- Participation 10 %
- Exams (1 per semester) 20 %
- Research papers (possibly 1 per semester) will be considered a test grade

30-week topical outline:

<i>Date</i>	<i>Wk</i>	<i>Topic</i>	<i>Exams/Labs/Papers Due</i>
9/10/07	1	Review of basic science concepts and all of Module 1	Experiment 1.1 Module 1 Test
9/17/07	2	Define and learn to measure energy and heat	Experiment 2.1
9/24/07	3	Apply concepts of heat and calculate heat	Exp. 2.2 & Module 2 Test
10/1/07	4	History and laws concerning elements and compounds, atomic theory	Experiment 3.1
10/8/07	5	Classifying and naming compounds	Exp. 3.2 & Module 3 Test
10/15/07	6	Classifying matter and its changes, Kinetic theory	Experiment 4.1(modified) & 4.2
10/22/07	7	Phase changes, writing and balancing chemical equations	Exp. 4.3 & 4.4 Module 4 Test Research Paper Due*
Mid-semester grades issued			
10/29/07	8	Types of chemical reactions (additional material will be supplied) and molecular mass.	Experiment on types of reactions.
11/5/07	9	Mole concept and calculations	Exp. 5.1 & Module 5 Test
11/12/07	10	Chemical equations and moles, limiting reactants, mass relationships in equations (stoichiometry)	Experiment 6.1
11/26/07	11	Volume relationships for gases, empirical and molecular formulas	Stoichiometry Experiment Module 6 Test
12/3/07	12	Electrical charge, atomic structure, isotopes, light and the electromagnetic spectrum	Experiment 7.1
12/10/07	13	Frequency and energy of light, models of the atom, electron configurations	Experiment 7.2 and Flame test experiment Module 7 Test
12/17/07	14	The Periodic table, and periodic properties	Experiment 8.1
1/7/08	15	Lewis structures of ionic and covalent compounds	Semester Exam
End of 1st Semester-Semester grades issued			

<i>Date</i>	<i>Wk</i>	<i>Topic</i>	<i>Exams/Labs/Papers Due</i>
1/14/08	16	Polyatomic ions, molecular geometry, polar and non-polar bonds	Experiment 9.1, 9.2 and Module 9 test
1/21/08	17	Acids and bases: properties, formula, and reactions	Experiment 10.1
1/28/08	18	Concentration, molarity, and solution stoichiometry/titrations	Experiment 10.2 Module 10 Test
2/4/08	19	Solubility, solutions and energy of dissolving	Experiments 11.1 & 11.2
2/11/08	20	Solution stoichiometry, molality, freezing point depression and boiling point elevation	Experiments 11.3 & 11.4 Module 11 Test
2/25/08	21	Pressure and gas laws	Cartesian Diver Experiment
3/3/08	22	Gas laws and gas stoichiometry	Exp. 12.1 Research paper due*
Mid-semester grades issued			
3/10/08	23	Energy of chemical reactions (enthalpy)	Experiment 13.1
3/17/08	24	Energy diagrams, the 2 nd law of thermodynamics, Gibbs Free energy	Module 13 Test
3/31/08	25	Reaction rates and rate calculations (kinetics)	Experiment 14.1
4/7/08	26	Temperature and catalyst effects on reaction rates	Experiment 14.2 Module 14 Test
4/14/08	27	Equilibrium & Le Chatelier's Principle	Experiment 15.1
4/21/08	28	Acid/Base equilibria and the pH scale	Experiment 15.2 Module 15 Test
4/28/08	29	Redox reactions, oxidation numbers	Experiment 16.1
5/5/08	30	Batteries and corrosion	Making a Battery Semester Exam
End of 2nd Semester			

*Mrs. Smith reserves the right to make changes to this and all other assignments in the syllabus presented. Currently the plan is to assign a short research paper in the first quarter and a longer paper in the third quarter instead of assigning science fair projects.