

BELHAVEN UNIVERSITY

O u r S t a n d a r d i s C h r i s t

Division of Sciences and Mathematics
Department of Chemistry & Physics
Fall, 2013

Instructor: Philip Carlson, Ph.D.

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Office: 334 Fitzhugh Hall

Course: CHE 111 – General Chemistry I

Location: Fitzhugh Hall, Room 329

Class Time: MWF 8:00 – 8:50 AM

Prerequisites: College Algebra (MAT 101)

Office Hours: See the end of this syllabus for a full listing of Dr. Carlson's office hours.

Catalogue Description: General Chemistry (3-3). Prereq: MAT 101 or consent of the instructor. A two-semester sequence that includes a study of topics such as stoichiometry, atomic and molecular structure, chemical bonding, the states of matter, phase equilibria, kinetics, thermodynamics, ionic equilibria, and electrochemistry. (Lecture 3)

Required Textbook:

→ Chemistry: A Molecular Approach, 3rd Edition, by Nivaldo J. Tro, 2014, Pearson

ISBN: 978-0-321-80924-7

→ We will also use MasteringChemistry which can be purchased with the text book using this

ISBN: 978-0-321-80471-6

→ If you obtained the textbook without MasteringChemistry access you can go to www.masteringchemistry.com to register for it.

Required Materials: A trusty scientific calculator capable of executing trigonometric functions. Access to a modern computer with internet functionality.

Statement of Purpose:

“Belhaven University prepares students academically and spiritually to serve Christ Jesus in their careers, in human relationships, and in the world of ideas. . . By developing servant leaders who value integrity, compassion, and justice in all aspects of their lives, the University prepares people to serve, not to be served.”

– Belhaven University Vision and Mission

The purpose of this course is to introduce the student to the concepts of general chemistry. Students will learn typical methods of analyzing the world from a scientific perspective. They will gain a well-rounded understanding of the different areas of chemistry and more fully appreciate God's world and ways. Students can utilize what they learn about chemistry to serve others and to converse with the scientific world. Those choosing careers in science will have a necessary foundation of chemical principles on which to build the specifics of further work. This class serves as a requirement for many

professional medical and graduate programs as well. The principles covered in this class are the foundation of many modern technologies that have affected every aspect of our lives.

Goals and Objectives: The primary goals of this first semester of general chemistry are:

- 1) To provide the student with a clear and logical presentation of the basic concepts and principles of general chemistry. These ideas will prepare students for the next step in their journey to serve the Lord and become servant leaders.
- 2) Learn the fundamentals of the properties of matter, measurement and uncertainty.
- 3) To strengthen an understanding of these scientific concepts and principles through a broad range of interesting applications to the real world. This includes an emphasis on historical events/situations and the history of science as well as many relevant current events.
- 4) Acquire a thorough understanding of the modern theory of atomic structure and atomic level phenomena.
- 5) To allow a deeper love/worship of God via a deeper understanding of His world. The ideas presented will foster a sense of awe at God's creation and introduce a sense of responsibility to utilize these concepts to serve others.
- 6) To increase the ability to solve problems in a logical and thought out manner.
- 7) To learn the symbolism and terminology of chemistry.
- 8) To obtain an introduction to modern chemical bonding theories and their implications.
- 9) To learn the organization and information conveyed by the periodic table of elements
- 10) To arouse a sense of stewardship and responsibility for all of God's creation.
- 11) To bolster the ability to be self-learners.
- 12) To learn to categorize/recognize/balance types of chemical reactions
- 13) Understand forms of energy and the roles they play within chemistry

Chemistry and Worldview:

Let's face it, we all have a worldview. That is, a way of viewing the world and the happenings in it. As Christians our worldview needs to be shaped by God, and His word – the Bible. How does science and chemistry in particular integrate into our worldview? We must start at the beginning. Psalms 33:6 ESV "By the word of the LORD the heavens were made, and by the breath of his mouth all their host." Hebrews 11:3 ESV "By faith we understand that the universe was created by the word of God, so that what is seen was not made out of things that are visible." Genesis 1:1 also tells us that God created everything and that the universe had a beginning. We are not told of God's beginning because one of His attributes is aseity. The fact that God exists is what makes rational thought possible. Logic has no true basis without God, and science has no true basis without logic.

Romans 1:18-25 Talks about mankind and his suppression of truth. It is man's natural state to be at odds against God. Even when the things of nature give testament to God, man can still choose to ignore the fact that God exists. When mankind ignores God he has no rational (consistent) basis on which to use rationality. He must borrow from the Christian worldview when he engages in logical argumentation and science.

An investigation of the natural sciences clearly shows the order and complexity with which God has designed our world. Even advanced concepts, such as quantum mechanics, show the beauty and intricacy with which God fashioned the workings of the universe. God laid out the concept of

scientific investigation and commanded mankind to be involved in such work in Genesis 1:28. This is the foundation of current modern scientific investigation and research.

The book of Isaiah shows God acting in a scientific manner (framed in the form of a rhetorical question) to demonstrate his superior knowledge of the Earth and its systems. Isaiah 40:12 ESV “Who has measured the waters in the hollow of his hand and marked off the heavens with a span, enclosed the dust of the earth in a measure and weighed the mountains in scales and the hills in a balance?”

Many of the chemical processes and the very elements (see the periodic table) are mentioned in the Bible – brass, tin, gold, silver – Num. 31:21-23; lead (Jer. 6:29); sulfur (Gen. 19:23-25), copper (Deut. 8:7,9), iron (Judg. 1:19) and others. A number of minerals (inorganic compounds of two or more elements which occur in the Earth in various locations and quantities) are also mentioned, including many precious stones such as amethyst (Rev. 21:19-20), ruby (Ex. 28:17-18), emerald (Rev. 4:3), sapphire (Rev. 9:17), and others.

Mankind must also use his scientific knowledge to engage the world. Jesus commanded in Matt. 22:34-40 that we are to love God and our neighbor. This speaks directly to civic engagement and being responsible with the way we impact our society. In chemistry this can mean that we are especially conscious about safety issues, waste generation, chemical usage, environmental impact and so on.

Attendance:

Attendance at class meeting is expected and required of all students. Rules of class attendance are governed by those regulations as established by the University, i.e. students are required to attend 80% of those classes scheduled. The first three tardies count for one absence. Should the student enter the classroom after the roll has been taken, it is his/her responsibility to inform the instructor of his/her presence *at the end of class*. Otherwise, an absence will have been recorded. Students leaving class too early are treated the same as tardy, i.e. the same rules apply. After the first three tardies, a tardy will be counted as one absence. **All** reasons for absences (for example, illness, representation for school activities, emergencies, and late registration) are included in the maximum number of absences. Should the maximum number of absences be exceeded, the student will be given a grade of F. This means that in a MWF class you are allowed to miss 8 class periods. There are no “excused” absences. Your 9th absence equates to an F in the class assigned by the registrar. If that point is reached, the assignment of an F is beyond Dr. Carlson’s control and is mandated by the registrar.

Grading, Evaluation of Performance:

The final grade for this course will be based on the total derived from the following sources:

Item	Percent of Final Grade
8 Quizzes	20%
6 Exams	60%
Connections	5%
Homework	15%

- **Quizzes** – (20% of total grade) There will be a total of ~10 quizzes given during the semester. Only 8 of these will count toward your final grade. Your lowest scoring quizzes will be dropped. The number of quizzes dropped will be a function of the number of quizzes given. That is, if we

only have 8 quizzes I may only drop 1 score, your lowest grade. There will be *no make-up quizzes!* The total number of quizzes is subject to change due to time constraints. Dr. Carlson reserves the right to allow additional replacement quizzes as desired.

- **Exams** – (60% of total grade) There will be five exams given during the semester and one final exam. The final exam will be over regular material covered since the last exam. Should a student miss a regularly scheduled exam and have a valid excuse (i.e. documented with a doctor's certificate or a note from the Resident Director in the dormitory), he/she will be allowed to make up that test at the convenience of the instructor. It is imperative to contact Dr. Carlson by email to arrange for an alternate time if you will be gone for a sanctioned university event (e.g. sports).
- **Connections** – (5% of total grade) Throughout the semester the student will be asked to write a two page paper on particular discussion topics. This will be a double spaced paper containing a minimum of 4 paragraphs and 5 references. This paper should not exceed three pages in length (not counting the references). The student is expected to interact with the material demonstrating knowledge of a Christian worldview perspective. The primary purpose of these assignments will be to properly utilize sources and learn to properly cite academic articles (which should utilize the approved ACS style of referencing).
- **Homework** – (15% of total grade) The homework assignments are accessible on the web at <http://www.masteringchemistry.com> Each assignment and due date will show up as it is assigned. Some of the assignments may be for extra credit and will be optional. We will typically have 1 HW assignment per textbook chapter.

Grading Scale: All grades are based on a standard university approved grading scale. The instructor will adhere to Belhaven's grading scale in assigning final letter grades in the course.

A=95-100%, A-=90-95%, B+=87-89%, B=83-86%, B-=80-82%, C+=77-79%, C=73-76%, C-=70-72%, D=50-69%, F<50%

Make-up Work: Students will not be allowed to make up any missed quizzes, homework assignments, or exams without a valid doctor's excuse (or some other form of proof as required by the instructor). Failure to submit and finish homework on time or to take quizzes or exams at the scheduled times will result in the student being assigned a grade of zero for that assignment. Homework extensions will be granted if the online system has technical difficulties or for any other reason deemed appropriate by Dr. Carlson.



Honor Code: Belhaven University physical science students are to operate under the principles of the Honor Code as outlined in the *Student Handbook*. (http://www.belhaven.edu/campus_life/Life/student_handbook.htm. Please read page 3).

FERPA: Belhaven University complies with all the provisions of the Family Education Rights & Privacy Act of 1974. This law concerns privacy of such things as social security numbers, student ID numbers, telephone queries, voice messaging, returning of papers, posting of grades, etc. As a student, this means that the instructor cannot discuss your grade in public or with anyone else without your explicit permission. See a summary from the university registrar here <http://www.belhaven.edu/pdfs/registrar/FERPAGUIDELINES.pdf>

Schedule: A schedule of topics to be covered, exam dates, and other important dates is attached and is subject to change as the term progresses.

CHE111 – General Chemistry I
Tentative schedule: Fall 2013

Week	Date	Day	Chapter/Topic	Text Section (Page) Reading Assignment
1	Au 21 Au 23	W F	Intro & Syllabus Chap. 1/Atoms, Molecules, Matter Ch. 1/Energy, Units, SigFigs, Chemical Problems →Chapter one verse readings: Is. 45:12, Col. 1:16, Jn. 1:1, Ps. 33:6	1.1 (1) - 1.4 (8) 1.5 (9) – 1.8 (33)
2	Au 26 Au 28 Au 30	M W F	Ch. 2/ Atoms, atomic theory, law of multiple proportions Ch. 2/e ⁻ s, Atomic Struc., Subatomic particles, Periodic Ch. 2/Atomic Mass, Molar Mass →Chapter two verse readings: Jer. 33:25, Mal. 3:6, Is. 40:12-15	2.1 (44) – 2.3 (51) 2.4 (51) – 2.7 (66) 2.8 (66) – 2.9 (75)
3	Sp 2	M	Labor Day Holiday – No Class	
	Sp 4	W	Exam 1 Covering Chapters 1 & 2	
	Sp 6	F	Chap. 3/Bonding, Chem. Formulas, Atom View, Ionic Cmpds	3.1 (86) – 3.5 (100)
4	Sp 9 Sp 11	M W	Chap. 3/Molecular Cmpds, Nomenclature, Mass&Moles,Comp Chap. 3/Det.Formula, Balancing Chem.Eqs, Organic Cmpds →Chapter three verse readings: Col. 1:17, Col. 2:1-4	3.6(101) – 3.9(114) 3.10(114)–3.12(126)
	Sp 13	F	Chap. 4/Stoichiometry, Limiting Reactant, Theoretical Yield	4.1 (138) – 4.3 (151)
5	Sp 16 Sp 18	M W	Chap. 4/Concentration, Aq. Soln., Solubility, Precipitation Rxn Chap. 4/Ionic Eqns, Acid Base Rxns, Redox Rxns →Chapter four verse readings: Matt. 22:37-39	4.4 (152) – 4.6 (166) 4.7 (166) – 4.9 (182)
	Sp 20	F	Exam 2 Covering Chapters 3 & 4	
6	Sp 23 Sp 25 Sp 27	M W F	Chap. 5/Pressure, Boyle's Charles' Avogadro's Gas Laws Chap. 5/Ideal Gas Law & Applications of it Chap. 5/Partial Pressures, Gases in Rxn, KMT, Real Gasses →Chapter five verse readings: James 4:13-14	5.1 (194) – 5.3 (206) 5.4 (206) – 5.5 (212) 5.6 (213) – 5.10 (234) Less on p. 225-230
7	Sp 30 Oc 2 Oc 4	M W F	Chap. 6/Energy, 1 st law Thermo., Heat & Work Chap. 6/ΔE for Rxns, Enthalpy, Calorimetry, ΔH Chap. 6/ΔH, Standard H, E in Environ. →Chapter six verse readings: Jn. 6:32-35	6.1(246) – 6.4(262) 6.5(262) – 6.8(272) 6.8 (272) – 6.10(283)
8	Oc 7 Oc 9 Oc 11	M W F	Exam 3 Covering Chapters 5 & 6 Chap. 7/Light, Bohr Model Chap. 7/ Waves of Matter, Quantum Mechanics	7.1(294) – 7.3(309) 7.4(309) – 7.5(318)
9	Oc 14 Oc 16 Oc 18	M W F	Fall Break – No Class Chap. 7/ QM cont., Atomic Orbitals →Chapter seven verse readings: Jn. 8:12, Matt. 5:14-16 Chap. 8/ Electron Configurations	7.5(318) – 7.6(327) 8.1(334) – 8.4(346)

10	Oc 21	M	Chap. 8/Valence Electrons, QM model, Periodic Trends, ions	8.4(346) – 8.7(358)
	Oc 23	W	Chap. 8/Ions, Electron Affinities, Periodic Behavior	8.7 (358) – 8.9(371)
	→Chapter eight verse readings: 1 Cor. 14:40			
		Oc 25	F	Exam 4
11	Oc 28	M	Chap. 9/Chemical Bonding, Electron Dots, Lewis Symbols	9.1(380) – 9.4(391)
	Oc 30	W	Chap. 9/Covalent Bonding, Lewis Structures, Electronegativity	9.5(391) – 9.7(399)
	Nv 1	F	Chap. 9/Resonance, Formal Charge, Octet Rule	9.7(399) – 9.9 (406)
12	Nv 4	M	Chap. 9/ Exceptions to Octet Rule, Bond Energy, Metallic Bond	9.9(406) – 9.11(414)
	→Chapter nine verse readings: Eph. 4:1-3, Col. 3:14			
	Nv 6	W	Chap. 10/VSEPR, Lone Pair effects, Predicting Geometries	10.1(424) –
10.4(437)				
	Nv 8	F	Chap. 10/Predicting Geo cont., Molecular Shape, Orbital overlap	10.4(437)–10.6(445)
13	Nv 11	M	Chap. 10/Hybridization & Multiple Bonding	10.7(445)-10.7(458)
	Nv 13	W	Chap. 10/Molecular Orbital Theory	10.8(458)-10.8(468)
	Nv 15	F	Chap. 10/MO Theory continued	10.8(468)-10.8(471)
	→Chapter ten verse readings: 1 Pet. 3:8-9			
14		Nv 18	M	Exam 5
	Nv 20	W	Chap. 11/Molecular view of states of matt., Intermolecular Force	11.1(482)-11.3(496)
	Nv 22	F	Chap. 11/Surface Tension, Viscosity, Vaporization, Vapor P	11.4(497)-11.5(506)
15	Nv 25	M	Chap. 11/Sublimation, Fusion, Heating curve, Phase diagrams	11.5(507)-11.9(517)
	→Chapter eleven verse readings: 1 Cor. 12:12-14, 12:25-26			
	Nv 27	W	Thanksgiving Break – No Class	
	Nv 29	F	Thanksgiving Break – No Class	
16	De 2	M	Last Day of Class	
	De 4	W	Finals Week	
	De 6	F	Finals Week	

BELHAVEN UNIVERSITY

Our Standard is Christ

Division of Sciences and Mathematics
Department of Chemistry & Physics

Schedule, Fall 2013

Philip Carlson, Ph.D.

Time	Monday	Tuesday	Wednesday	Thursday	Friday
8:00 am	CHE 111 General Chemistry I		CHE 111 General Chemistry I		CHE 111 General Chemistry I
9:00 am		PHY 125 Science & Culture I: Physical Sci <i>Irby 200</i>		PHY 125 Science & Culture I: Physical Sci <i>Irby 200</i>	
10:00 am	PHY 241 General Physics I		PHY 241 General Physics I		PHY 241 General Physics I
11:00 am	<i>Office Hours*</i>	Chapel	<i>Office Hours*</i>	Faculty Meetings	<i>Office Hours*</i>
12:00 pm					
1:00 pm	<i>Office Hours*</i>	<i>Office Hours*</i>	PHY 243 General Physics I Laboratory <i>Fitzhugh 232</i>	<i>Office Hours*</i>	CHE 351 Chemical Research I
2:00 pm					
3:00 pm					
4:00 pm					
5:00 pm					

* Dr. Carlson is available to meet with students to discuss course work and academic advising during all designated Office Hours. To schedule an appointment send an email to pcarlson@belhaven.edu or call 601-968-8997. Other appointment times are possible.

Academic Calendar (From Registrar)

FALL SEMESTER 2013

Aug. 14, Wed.	Service of Dedication for the School Year
Aug. 15-16, Thurs.-Fri.	Faculty Workshop
Aug. 17, Sat.	Residence Halls open for new students - 9 a.m.
Aug 18, Sun.	Residence Halls open for all students - 1 p.m.
Aug. 17-20, Sat.- Tues.	Welcome Week: New Student Orientation
Aug. 19, Mon.	Open Registration continues for Jackson Graduate Education Studies
Aug. 19-20, Mon.-Tues.	Advising & Registration
Aug. 21, Wed.	Day and Evening classes begin
Aug. 27, Tues.	Last day to enter a course or change enrollment status to pass/fail, audit, etc.
Aug. 27, Tues.	Last day to drop a course without a grade
Sept. 2, Mon.	Labor Day Holiday
Sept. 17, Tues.	Last day to drop a course with a grade of W
Sept. 20, Fri.	Application deadline for May 2014 Graduation (Traditional, Graduate Studies, Online, Adult Studies)
Oct. 12, Sat.	Mid-semester holiday begins 1:00 p.m.
Oct. 16, Wed.	Mid-semester holiday ends at 8:00 a.m.
Oct. 17, Thurs.	Mid-semester grades to be posted by 8:30 a.m. (all grades: A-F)
Oct. 25-26	Homecoming
Oct. 28-Nov. 1, Mon-Fri.	Advising and Advance Registration for Jackson Traditional students
Nov. 4, Mon.	Open Registration begins for Jackson Graduate Education Studies
Nov. 18, Mon.	Last day to drop a course with a grade of WP or WF; grade of F for course drops after Nov. 18.
Nov. 27, Wed.	Thanksgiving Holiday begins at 8:00 a.m.
Dec. 2, Mon.	Thanksgiving Holiday ends at 8:00 a.m.
Dec. 2, Mon.	Last regular class meeting
Dec. 3, Tues.	Study Day
Dec. 3-10, Tues. - Tues.	Final Examinations - Begin 6:00 p.m. Tuesday evening Dec. 3
Dec. 5, Thurs.	Commencement for Orlando graduates (7:00 p.m.)
Dec. 10, Tues	Graduating seniors' grades to be posted by 8:30 a.m.; All grades to be posted by 3:00 p.m.
Dec. 12, Thurs.	Residence Halls close at 5:00 p.m. (all residents with the exception of commencement participants)
Dec. 13, Fri.	Commencement for Chattanooga graduates (7:00 pm)
Dec. 14, Sat.	Commencement for Aug. & Dec. graduates, Jackson, MS (Adult Studies, Graduate, and Online Only)
Dec. 14, Sat.	Residence Halls close at 5:00 p.m. (for commencement participants)