

University of Houston-Downtown

Course Prefix, Number, and Title: CHEM 1305: Introductory Chemistry

Credits/Lecture/Lab Hours: 3/3/0

Foundational Component Area: Life and Physical Sciences

Prerequisites: Credit or enrollment in CHEM 1105 and credit or enrollment in MATH 1301 or MATH 1310.

Co-requisites: None

Course Description: A survey of chemistry which focuses on the composition, properties and interaction of substances necessary to produce new materials. Topics include stoichiometry, atomic structure, chemical bonds, states of matter, electrolyte solutions and chemical reactions. This course is required for nursing or similar professional programs and may be taken prior to the general chemistry courses for science majors.

TCCNS Number: CHEM 1305

Demonstration of Core Objectives within the Course:

Assigned Core Objective	Learning Outcome Students will be able to:	Instructional strategy or content used to achieve the outcome	Method by which students' mastery of this outcome will be evaluated
Critical Thinking Empirical & Quantitative Reasoning	Utilize scientific processes to identify questions pertaining to natural phenomena.	<p>1. Identify core elements which have or will be covered by the course in the world around them – Students will be shown the world in a new light. Every unit will be linked to elements of chemistry which the students are familiar with, but have not analyzed using the scientific process. Samples of unit topics include gasses, chemical reactions, chemical changes, structures and their shapes.</p> <p>2. Hypothesis Testing – students will learn to generate meaningful hypothesis that question the world around them. Particular focus will be made on understanding</p>	<p>1. In addition to regular testing methodology on the topics, students will engage in a group project in the co-requisite lab (CHEM 1105) which focuses on a current topics in chemistry which the majority of the students are familiar with (for example, topics over “the chemistry of energy”). After doing a scholarly paper on this subject, which will require use of the library and consultation with the professor, the group will present their findings to their colleagues. Each member of the group will be required to present. Presentations will be evaluated for both scientific accuracy and oral communication skills using a rubric.</p> <p>2. The students will work in teams and by themselves in lab to test hypotheses made in the lab.</p>

		whether the hypothesis is relevant, and whether it has been tested.	Students will be responsible to be able to look at an experiment (on paper during a test), formulate a hypothesis, and explain why or why not the outcome was what it was. Students will be graded on the quality of their ability to hypothesis test.
Critical Thinking Empirical & Quantitative Reasoning	Utilize scientific processes to develop hypotheses, collect and analyze data using quantitative and qualitative measures.	<p>1. Laboratory experiments - students will perform laboratory experiments in CHEM 1105 to collect data in the laboratory, create graphs, compare quantitative data and draw conclusions about the data obtained.</p> <p>2. Hypothesis Testing: Example: Chemical Equilibrium – students will form hypotheses regarding formation of products in a chemical reaction, and the reversibility of that reaction, based on simple factors such as concentration. Example of Hypothesis Testing using Le Chatelier’s Principle – students will determine the direction of a reaction based on Le Chatelier’s principle, coupled with the concentrations of reactants and products. The hypothesis is that it is possible to determine the direction of reaction when a system is perturbed, once equilibrium has been established.</p> <p>Other examples of chemical principles which will be taught via hypothesis testing include matter and energy, gasses, and chemical reactions.</p>	<p>1. Students will keep a laboratory notebook or worksheets, and learn to record careful observations. They will learn the methodology to keep a good lab book or worksheets, concentrating on keeping data in an organized complete fashion, during the experimentation phase. The grading of this record will be conducted following an established rubric. The rubric will include points for both scientific accuracy and quality of written communication.</p> <p>2. The students will be able to analyze scientific evidence presented to them. For example, students could be presented with chemical equilibrium question and through kinesthetic learning examples, and multiple repetitions, they will provide robust answers about the equilibrium. The assessment will consist of online homework problems, coupled with test questions centered on concepts, rather than just numbers based results.</p> <p>Similar analysis of other chemical principles through hypothesis testing will be taught to deepen the understanding of chemical phenomenon.</p>

<p>Critical Thinking</p> <p>Empirical & Quantitative Reasoning</p> <p>Communication</p>	<p>Utilize scientific processes to effectively communicate the analysis and results using written, oral and visual communication.</p>	<p>States of Matter - Demonstration – Students will see various states of matter, and the changes that occur with temperature. The students will need to describe the changes which they have seen both mathematically, and subjectively, with “plain words”.</p> <p>Quantity Relationships in Chemical Reactions – The students will understand the severity of CO₂ production when hydrocarbons are combusted, understanding both the amounts and the chemical reaction.</p>	<p>The instructor will do presentations in class and then the students will need to describe why various things happen with words, drawings, and equations. For example, the instructor may do the infamous “freezing the banana”, or “freezing a balloon with air”, using dry ice and students OR students will find themselves on a flight from Seoul, South Korea to Amsterdam and they will need to calculate the amount of CO₂ produced by this one flight. Assessment will be via normal testing. However, non-multiple choice, essay questions may be used to make sure the student understands the concepts.</p> <p>Group presentations on energy topics will require oral presentations and will be evaluated by rubric (see above).</p>
<p>Teamwork</p>	<p>Collaborate in the evaluation of the quality of scientific evidence from multiple perspectives toward the goal of reaching a shared objective.</p>	<p>1. Chemical Safety – Students will watch a presentation about chemical safety and determine if their safety practices are adequate.</p> <p>2. Chemistry and the Presentation of Data: Students will look at various aspects of power generation, and understand whether each of the various methods of producing energy is safe, economical, and part of the future Energy mix.</p>	<p>1. Students will watch a fun video in class, and determine at least 10 of the safety violations in the film. (Note: it is much harder than it sounds, as the film is amusing and cute, but has over 68 safety violations). This is a mandatory exercise. No points will be assigned but is required before students may continue in the lab.</p> <p>2. The students will, as part of the laboratory class, learn about a topic in chemistry (for example, various types of energy, and how it relates to chemistry). Each group will be required to take a positive or negative position (for example on a form of energy generation), and present to the class their position (see above). Assessment will come from the verbal presentation, coupled with questions on the class exams.</p>

Additional Course Outcomes:

Upon completion of this course the student would be able to:

- Explain how the Scientific Method can be utilized to understand and/or solve "real world" multi-variable problems.
- Explain the major two types of chemical bonding-covalent & ionic; how they apply to reactions of metals and non-metals, and the affect such bonds have on stability, structure and certain chemical properties.
- Using chemical formulas, be able to describe some basic properties of compounds (including acids & bases), and how they should behave in chemical reactions.
- Utilizing the Periodic Table, be able to describe some of the atomic physical and chemical properties of the known elements.
- Be able to discuss some of the chemical parameters and social issues associated with earth's air and water environments.
- Be able to discuss energy (and energy generation), including current and future forms of renewable energy. This will include the understanding of some of the major differences between available energy sources, consequences associated with their usage, and how their costs and long term availability affect the economic and environmental future of planet Earth.
- Understand the most common nuclear reactions, radioactivity and half-lives of isotopes in addition to the most common forms of nuclear energy generators and their related issues.
- Discuss some of the chemical and energy factors associated with human nutrition and how the body utilizes certain food stuffs.
- Understand some of the basic structures of common drugs (both legal and illegal) and why they behave the way they do when ingested by humans.

Course Outline:

Lecture:

Instructional Outline

Chem 1305 - Tentative Instructional Outline: Please be advised that this is a tentative schedule; lecture topics, labs and exam dates may be changed if necessary during the course of the semester. All lectures are posted online. Read the chapters BEFORE class.			
Week	Date	In Class	Notes (see)
1	01/14/13	Review syllabus. Start renewable energy.	
	01/16/13	Chapters 1 (Scientific Method) and 2 (Matter and Energy).	
2	01/21/13	<i>MLK Day. No Class.</i>	
	01/23/13	Chapter 3 (Measurement). UNITS.	
3	01/28/13	Chapter 4 (Gasses).	
	01/30/13	Exam 1.	
	01/30/13	Last day to drop a class without a grade (Official Day of Record)	
4	02/04/13	Chapter 5 (Atomic Theory)	Concentrate on Periodic Table.
	02/06/13	Chapter 6 (Chemical Nomenclature).	
5	02/11/13	Chapter 7 (Chemical Formula – Relationships)	
	02/13/13	Chapter 8 (Chemical Reactions)	

CHEM 1305: Introductory Chemistry

6	02/18/13	Exam 2.	
	02/20/13	Chapter 9 (Chemical Change)	
7	02/25/13	Chapter 10 (Quantity Relationships in Chemical Reactions).	
	02/27/13	Chapter 10 continued.	
8	03/04/13	Chapter 11 (Quantum Model of the Atom)	
	03/06/13	Chapter 12 (Chemical Bonding)	
9	03/11/13 03/17/13	<i>Spring Vacation. Enjoy the chemistry in the world around you. Oh, and no class!</i>	
10	03/18/13	Energy – Part 2.	
	03/20/13	Chapter 13 (Structure and Shape).	
11	03/25/12	Chapter 15 (Gasses, liquids and solids).	
	03/27/12	Exam 3.	
** *****	03/28/13	<i>“W” Day - Last day to withdraw from a course (grade of “W” can be assigned).</i>	
12	04/01/13	Chapter 16 (Solutions).	
	04/03/13	Chapter 17 (Acid-Base).	
13	04/08/13	Chapter 18 (Chemical Equilibrium)	
	04/10/13	Chapter 20 (Nuclear Chemistry).	
14	04/15/13	Presentations – Day 1.	
	04/17/13	Chapter 21 (Organic Chemistry).	Yes, memorize the functional groups!
15	04/22/13	Exam 4.	
	04/24/13	Presentations – Day 2.	
16	04/29/13	Then, Energy – Part 3	Putting it all together.
	05/01/13	Review for final. ** Note that this is optional, as it is a reading day during finals. **	
Final	05/08/13	Final Exam. 10:00 am– 12:30 pm.	

Lab:

Week	Date	To do in lab	Reference (see)
1	08/27/12	Introduction, Syllabus / Lab check in, safety Videos	Syllabus posted on Blackboard
2	09/03/12	NO CLASS – Labor Day.	
3	09/10/12	Experiment 1: Properties and Changes of Matter	Significant Figures
	09/12/12	Last day to drop a class without a grade (Official Day of Record)	
4	09/17/12	Quiz 1.	
		Experiment 2: Chemistry of Some Household Products	
5	09/24/12	Experiment 4. Densities of Liquids and Solids.	
6	10/01/12	QUIZ 2. Experiment 7: Percentage of Oxygen in Potassium Chlorate	Turn in Lab Notebooks, Dimensional Analysis Worksheets Due.

7	10/08/12	Experiment 8: Calorimetry	
8	10/15/12	Experiment 11: Mole Ratio for a Chemical Reaction	Formula Writing, Avagadro's Number Moles Worksheets due.
9	10/22/12	QUIZ 3. Experiment 15: Molecular Models: A Study Assignment	Equation Balancing Worksheet Due. Lab report on experiment 11 due on turnitin.com via Blackboard.
10	10/29/12	YOU MUST READ and understand Lab 20 and 21. Experiment 25: Measurement of pH with Indicators	Types of reactions, Stoichiometry Worksheet Due.
"W" Day	11/01/12	<i>Last day to withdraw from a course (grade of "W" can be assigned).</i>	
11	11/05/12	QUIZ 4. Experiment 23: A Study of Reaction Rates	Lab report on experiment 25 due on turnitin.com via Blackboard.
12	11/12/12	Experiment 30: Esters	Lab report on experiment 23 due on turnitin.com via Blackboard.
13	11/19/12	QUIZ 5. Experiment 32: Preparation and Properties of a Soap	
14	11/26/12	<i>Final Examination (Comprehensive, written)</i> <i>1:00 pm – 3:00 pm.</i> <i>Lab Check out</i>	Turn in Lab Notebooks.

Lecture-Grading/Course Content which Demonstrates Student Achievement of Core Objectives:

Course Grade	A: 90-100	B: 80-89	C: 70-79	D: 60-69	F: 0-59
Activity	Details				
OWL	Nineteen assignments.				20%
Exams	Four Exams. Lowest exam dropped.				30%
Energy Paper Presentation	Class Presentation				5%
Presentation skills	Office hour participation or 10 minute 1:1 exam during finals.				5%
Energy Term Paper	Energy Topic Paper (Up to 3% EC to get t in early)				10%
Final Exam	Comprehensive Final Exam.				30%
Total					100 %

Lab: Grading/Course Content which Demonstrates Student Achievement of Core Objectives:
Course Grade A: 90-100 B: 80-89 C: 70-79 D: 60-69 F: 0-59

Quizzes	Five quizzes will be administered for the semester. These will be given on content covered during the previous week's classes and experiment. They are cumulative (but will emphasize the most recent). You may drop the lowest. Other quizzes may be added.	20%
Final Exam	Comprehensive written Final Exam.	20%
Laboratory Reports	There will be 2 written reports that will be submitted to Turnitin.com. These will each be worth 10%. You MUST turn these in on-time. You MUST use the format on Blackboard.	20%
Pre-lab	The pre-lab for EVERY lab must be typed, and submitted to Turnitin on Blackboard before the start time of each lab. The hypothesis is ½ the grade of the pre-lab. No pre-lab means that you may not do the lab.	10%
Laboratory Notebook	The lab notebook will be inspected, and graded for accuracy and completeness.	20%
Graded Worksheets	Worksheets from the book assigned in this syllabus	10%
Total		100%