UC 12297 135

CBM003 ADD/CHANGE FORM

☒ Undergraduate Council	or	☐ Graduate/Professional Studies Council
☐ New Course ☒ Course Change		☐ New Course ☐ Course Change
Core Category: Life/Phys Sci Effective Fall ~~2013~~ 2014		Effective Fall 2013

APPROVED SEP - 4 2013

RECEIVED APR - 4 2013

1. Department: CHEM College: NSM
2. Faculty Contact Person: Bott Telephone: 3-2771 Email: sbott@uh.edu
3. Course Information on New/Revised course:
   - Instructional Area / Course Number / Long Course Title: CHEM / 1331 / Fundamentals of Chemistry 1
   - Instructional Area / Course Number / Short Course Title (30 characters max.) CHEM / 1331 / FUNDAMENTALS OF CHEMISTRY
   - SCH: 3 Level: FR CIP Code: ____ Lect Hrs: 3 Lab Hrs: 0
     ↳ 40.0501.0002
4. Justification for adding/changing course: **To meet core curriculum requirements**
5. Was the proposed/revised course previously offered as a special topics course? ☐ Yes ☐ No
   If Yes, please complete:
   - Instructional Area / Course Number / Long Course Title: ____ / ____ / ____
   - Course ID: _____ Effective Date (currently active row): _____
6. Authorized Degree Program(s): _____
   - Does this course affect major/minor requirements in the College/Department? ☒ Yes ☐ No
   - Does this course affect major/minor requirements in other Colleges/Departments? ☒ Yes ☐ No
   - Can the course be repeated for credit? ☐ Yes ☒ No (if yes, include in course description)
7. Grade Option: Letter Instruction Type: Lect. (Note: Lect/Lab info. must match item 3, above.)
8. If this form involves a change to an existing course, please obtain the following information from the course inventory: Instructional Area / Course Number / Long Course Title
   ____ / ____ / ____
   - Course ID: _____ Effective Date (currently active row): _____
9. Cr. 3. (3-0). Prerequisite: MATH 1330 or equivalent and successful completion of either the chemistry placement test or CHEM 1301. For science and engineering majors. May not be applied toward a degree until CHEM 1111 is successfully completed. Credit may not be applied to a degree for both CHEM 1331 and CHEM 1301 or CHEM 1372. General principles, fundamental laws, atomic & molecular structure, states of matter, & elementary inorganic, nuclear, & organic chemistry.
10. Print/Type Name: Ian Evans

REQUEST FOR COURSES IN THE CORE CURRICULUM

Originating Department or College: Chemistry
Person Making Request: Simon Bott Telephone: x3-2771
Email: sbott@uh.edu
Dean's Signature: _____ Date: 11/12/12

Course Number and Title: CHEM 1331, Fundamentals of Chemistry 1
Please attach in separate documents:

X Completed CBM003 Add/Change Form with Catalog Description
X Syllabus

List the student learning outcomes for the course (Statements of what students will know and be able to do as a result of taking this course. See appended hints for constructing these statements):

1. Describe matter and its measurement, including calculations done on measurements. 2. Demonstrate an understanding of basic chemical nomenclature. 3. Relate basic atomic theory to the trends of the periodic table. 4. Correlate chemical equations and stoichiometry. 5. Recognize & solve reactions occurring in aqueous solution. 6. Apply principles of Thermochemistry to physical and chemical changes. 7. Relate the electronic structure of an atom to the trends on the periodic table. 8. Demonstrate an understanding of chemical bonding and its relationship to molecular structure. 9. Describe the relationship between pressure, volume, temperature, and number of moles of a gas and calculate changes in quantity when the pressure, volume, or temperature of a gas is varied. 10. Apply critical thinking skills to solve problems in chemistry.

Component Area for which the course is being proposed (check one):

***Note:** If you check the Component Area Option, you would need to also check a Foundational Component Area.

☐ Communication
☐ Mathematics
☐ Language, Philosophy, & Culture
☐ Creative Arts
X Life & Physical Sciences
☐ American History
☐ Government/Political Science
☐ Social & Behavioral Science
☐ Component Area Option

Competency areas addressed by the course (refer to appended chart for competencies that are required and optional in each component area):

X Critical Thinking	X Teamwork
X Communication Skills	☐ Social Responsibility
X Empirical & Quantitative Skills	☐ Personal Responsibility

Because we will be assessing student learning outcomes across multiple core courses, assessments assigned in your course must include assessments of the core competencies. For each competency checked above, indicated the specific course assignment(s) which, when completed by students, will provide evidence of the competency. Provide detailed information, such as copies of the paper or project assignment, copies of individual test items, etc. A single assignment may be used to provide data for multiple competencies.

Critical Thinking:
Questions on midterm exams will assess critical thinking. Particular examples include questions from (see attached syllabus for detailed learning outcomes) 3C, 3F, 4C, 5C, 7C, 7F, 7H, 7J, 8F, 8I, 8K, 9G

Communication Skills:
While there are many short-answer questions associated with Blackboard homeworks in this specific course that can be used to assess communication skills, a better range of assessments can be found in the associated (and required) lab class, CHEM 1111. In particular, post-lab assessments can be used for this assessment.

Empirical & Quantitative Skills:
There are obviously numerous opportunities to assess these in a chemistry class. Again, questions on midterm exams that are associated with Learning Outcomes 1, 4, 5, 6, 9.

Teamwork:
The entire lab class (CHEM 1111) is one in which students work in pairs or groups. Ideally, a university-developed instrument will be used to assess this competency,

Social Responsibility:
n/a

Personal Responsibility:
n/a

Will the syllabus vary across multiple section of the course? ☐ Yes X No
If yes, list the assignments that will be constant across sections:
Click here to enter text.

Inclusion in the core is contingent upon the course being offered and taught at least once every other academic year. Courses will be reviewed for renewal every 5 years.

The department understands that instructors will be expected to provide student work and to participate in university-wide assessments of student work. This could include, but may not be limited to, designing instruments such as rubrics, and scoring work by students in this or other courses. In addition, instructors of core courses may be asked to include brief assessment activities in their course.

Dept. Signature: _____

The following courses have been reviewed and approved by the NSM Curriculum Committee to meet the new core requirements. Given the length of the individual submissions I have elected to submit these requests by electronic means only.

Natural Sciences: Core Courses

BIOL 1309 – Human Genetics and Society

BIOL 1310 – General Biology

BIOL 1320 – General Biology

BIOL 1361 - Introduction to Biological Science I

BIOL 1362 - Introduction to Biological Science II

CHEM 1301 – Foundations of Chemistry

CHEM 1331 – Fundamentals of Chemistry I

CHEM 1332 – Fundamentals of Chemistry II

GEOL 1302 - Introduction to Global Climate Change

GEOL 1330 - Physical Geology

GEOL 1340 - Introduction to Earth Systems

GEOL 1350 - Introduction to Meteorology

GEOL 1360 - Introduction to Oceanography

GEOL 1376 - Historical Geology

PHYS 1301 - Introductory General Physics I

PHYS 1302 - Introductory General Physics II

PHYS 1321 - University Physics I

PHYS 1322 - University Physics II

Mathematics: Core Courses

MATH 1310 – College Algebra

MATH 1311 – Elementary Mathematical Modeling

Math/Reasoning: Core Courses

COSC 1306 – Computer Science and Programming

MATH 1330 - Precalculus

MATH 1431 - Calculus I

MATH 1432 – Calculus II

MATH 2311 – Introduction to Probability and Statistics

Writing in the Disciplines: Core Courses

BCHS Biochemistry Lab II

BIOL 3311 – Genetics Lab

PHYS 3313 – Advanced Lab I

Ian Evans

Associate Dean

4/4/13

CHEM 1331
Summer 2 2012

INSTRUCTOR: Simon Bott, Room 138-A, Fleming Building (713-743-2771), sbott@uh.edu
Office Hours: By appointment.

TEXT: Silberberg, "Chemistry: The Molecular Nature of Matter and Change." 5th, 6th or 7th Edition. Study Guide and Solutions Manual for this text are optional.

REQUIREMENTS: You must have passed CHEM 1301 or had a good year of high school chemistry. In addition, a good pass in precalculus is required.

GRADING: There will be 3 exams of 20 questions each given during the semester and a final exam of 40 questions. Every chapter has at least one Blackboard homework associated with it. There will also be a number of "pop" quizzes given in class, which will combine with the Blackboard to account for 20 points. Your final letter grade will be calculated out of 100 points; the sum of the final exam, the Blackboard/quizzes and your best TWO exam scores.

CALCULATORS: Much of this class involves calculations. We will do these both with and without calculators. When we need to use them, you MUST have a NON-PROGRAMMABLE scientific (with scientific notation and logs) calculator that you can use.

ATTENDANCE: You are encouraged to attend class as an aid to understanding the material as well as to take the quizzes (which are an important part of your final grade!). In addition, I am not prepared to help a student who has multiple unexcused absences from class. ALL EXAMS are compulsory. **Absolutely no make up exams or quizzes will be given.**

NOTES:

1. All drops are the responsibility of the student.
2. ALL GRADED WORK SHOULD BE DONE INDIVIDUALLY. The UH Academic Honesty Policy is in effect.
3. Any students who need special accommodations are responsible for communicating these to me at least a week before they are required.
4. In exams, only non-programmable calculators without alphanumeric capability are allowed. CASA also has rules about bags, etc.
5. This is a TOUGH class to be taking during the summer. You will need to devote at least 4 efficient hours of study a day OUTSIDE class in order to achieve the best grade of which you are capable. I strongly discourage you from taking other classes or trying to maintain a time-demanding job during the summer while you are taking this class.

PROVISIONAL SYLLABUS (You are responsible for ALL material in chapters 1 to 11, regardless of class coverage. I also expect you to know the names that correspond to the symbols for the first 36 elements):

Mon. 4th June	Introduction, Chapter 2 (*Components of Matter*)
Tues. 5th June	Chapter 2 (*Components of Matter*)
Weds. 6th June	Chapter 3 (*Stoichiometry)*
Thurs. 7th June	Chapter 3 (*Stoichiometry)*
Fri. 8th June	Chapter 4 (*Chemical Reactions)*
Mon. 11th June	Chapter 4 (*Chemical Reactions)*
Tues. 12th June	Chapter 5 (*Gases)*
Weds. 13th June	Chapter 5 (*Gases*)
Thurs. 14th June	Chapter 6 (*Thermochemistry)*
Fri. 15th June	Chapter 6 (*Thermochemistry)*
Mon. 18th June	Chapter 7 (*Atomic Structure)*
Tues. 19th June	Chapter 7 (*Atomic Structure)*
Weds. 20th June	Chapter 8 (*Electron Configuration and Periodicity)*
Thurs. 21st June	Chapter 8 (*Electron Configuration and Periodicity)*
Fri. 22nd June	Chapter 9 (*Chemical Bonding*)
Mon. 25th June	Chapter 9 (*Chemical Bonding*)
*Tues. 26th June	Chapter 10 (*Shapes of Molecules*)
Weds. 27th June	Chapter 10 (*Shapes of Molecules*)
Thur. 28th June	Chapter 10 (*Shapes of Molecules*)
Fri. 29th June	Chapter 11 (*Covalent Bonding*)
Mon 2nd July	Chapter 11 (*Covalent Bonding*)
Fri. 6th July	**COMPREHENSIVE FINAL AT CASA**

*LAST DAY TO DROP CLASS.

Exams (to be taken at the CASA Testing Center in the Susanna Garrison Gym, #532 on map)

Exam 1	Friday 15th June (Chapters 2 to 4)
Exam 2	Friday 22nd June (Chapters 5 to 7)
Exam 3	Friday 29th July (Chapters 8 to 10)
Final	Friday 6th July (All material)

You are responsible for scheduling your own test (NOT DURING CLASS TIME).

I reserve the right to change the above syllabus depending upon our rate of progress. I will NEVER change the test dates, however.

Blackboard homework will be available from the start of the coverage of the material to the day of the test covering the material. NO EXCEPTIONS OR EXTENSIONS. You can take each assignment as often as you want within that time, with at least an hour between attempts. I suggest you familiarize yourself with the Blackboard protocols as quickly as possible! Go to www.uh.edu/Blackboard to get started. It is YOUR responsibility to ensure that you can access this material.

Learning Outcomes

By the end of this class, the student (you) will be able to:

1. Describe matter and its measurement, including calculations done on measurements.

A. State the basic units of measurement for length, mass, volume and temperature in the SI system.
B. Give the numerical equivalent of selected SI prefixes.
C. Convert temperatures between Fahrenheit, Celsius and Kelvin scales.
D. Express numerical answers to the correct number of significant figures.
E. Solve problems using dimensional analysis, including conversion of units.
F. Solve problems involving density.
G. Distinguish the microscopic and macroscopic views of the three states of matter (solid, liquids and gases).
H. Distinguish among elements, compounds and mixtures.
I. Distinguish between physical and chemical properties and physical and chemical changes.

2. Demonstrate an understanding of basic chemical nomenclature.

A. Write the name and symbol for selected elements.
B. Write the name and symbol for selected polyatomic ions.
C. Write names and formulas for ionic, covalent compounds, acids.

3. Relate basic atomic theory to the trends of the periodic table.

A. Describe forms of matter and their structures at the atomic level.
B. Describe subatomic particles and how there are distributed inside atoms.
C. Explain how a variety of experiments contributed to our understanding of atomic structure.
D. Identify isotopes and use natural abundance data to calculate average atomic mass.
E. Identify the following areas of the periodic table: metals, nonmetals and metalloids; main groups: alkali metals, alkaline earth metals, halogens, transition metals, lanthanides & actinides, and noble gases.
F. Use the periodic table to predict the chemical properties of elements.

4. Correlate chemical equations and stoichiometry.

A. Use Avogadro's number and the definition of the mole in calculations.
B. Write balanced chemical equations that describe chemical reactions.
C. Use balanced chemical equations to relate the mass of a reactant to the mass of a product.
D. Determine the empirical formula from the percent composition of a substance or data from combustion reactions.
E. Determine a molecular formula of a substance from the empirical formula and molar mass.
F. Determine the limiting reactant in a chemical reaction.
G. Calculate the theoretical and percent yields in a chemical reaction.
H. Express the concentrations of solutions in different units and convert from one set of units to another.

5. Recognize, predict and analyze reactions occurring in aqueous solution.

A. Explain how to make solutions of given concentration.
B. Explain how to dilute solutions to a specified volume or concentration.
C. Solve solution stoichiometry and titration problems.
D. Identify aqueous reactions by type: precipitation, acid-base, or oxidation-reduction (redox) reaction.
E. Distinguish among strong, weak and nonelectrolytes in solution.
F. Predict precipitation reactions using solubility rules and write balanced complete and net ionic equations.
G. List the common acids and bases and classify each as a strong or weak electrolyte.
H. Assign oxidation numbers to atoms in molecules and ions.
I. Identify oxidizing and reducing agents. Balance oxidation-reduction reactions.

6. Apply principles of Thermochemistry to physical and chemical changes.

A. Recognize and illustrate the law of conservation of energy.
B. Distinguish between a system and its surroundings and describe the energy changes in a system and its surroundings during a given reaction.
C. State the first law of thermodynamics.
D. Identify familiar endothermic and exothermic processes.
E. Calculate changes in the internal energy of a system.
F. Solve problems involving enthalpies for physical and chemical changes.
G. Solve calorimetry and heat capacity problems.
H. Calculate enthalpy changes using Hess' law and measured enthalpies of reaction, from standard enthalpies of formation and by using bond energies.
I. Recognize and write equations for formation reactions.

7. Relate the electronic structure of an atom to the trends on the periodic table.

A. Solve problems relating frequency, wavelength and energy of electromagnetic radiation.
B. Describe the wavelike and particle-like properties of electromagnetic radiation.
C. Explain the complementary nature of the absorption and emission lines of atomic spectra and relate them to the transitions of electrons between energy levels in atoms.
D. Describe the wave mechanical model of the atom.
E. Describe *s*, *p*, *d*, & *f* orbitals.
F. Assign quantum numbers to orbitals and thus describe the size, energy and orientation of orbitals. Explain the energies of orbitals in multielectron atoms.
G. Write electron configurations and draw orbital diagrams of atoms and monatomic ions.
H. Relate position on the periodic table to electron configuration and quantum numbers.
I. Describe the scientific contributions of Planck, Einstein, de Broglie, Bohr, Schrodinger, Heisenberg, Pauli and Mendeleyev.
J. Relate to and predict from the periodic table the size of atoms, ionization energies, electronic affinities, ion formation, and reactivity.
K. Explain the observed changes in value of the successive ionization energies for a given atom.
L. Predict the relative size of anions and cations formed from an atom.
M. Describe the periodic trends in metallic and nonmetallic behavior.

8. Demonstrate an understanding of chemical bonding and its relationship to molecular structure.

A. Describe ways in which covalent, ionic, and metallic bonds are alike and those in which they differ.
B. Draw Lewis structures for atoms, ions and covalent compounds, recognizing when multiple bonds, resonance structures, expanded valence shells, incomplete valence shells and odd electrons are needed.
C, Relate macroscopic properties of substances to the type of bonding present.
D. Understand the concept of electronegativity and Use electronegativity differences between bonding atoms to classify bonds as non-polar, polar covalent or ionic.
E. Assign formal charges and use them to identify preferred resonance structures.
F. Describe the relationships and predict relative sizes of bond order, length, and energy.
G. Explain the theory of valence-shell electron-pair repulsion (VSEPR)
H. Use VSEPR to predict shapes and bond angles in molecules.
I. Predict the polarity of molecules from their structure.
J. Assign hybridization to atoms in molecules and ions.
K. Use valence bond theory to explain bond angles and molecular shapes.
L. Understand and predict simple delocalization of electrons.
M. Draw molecular orbital (MO) diagrams of diatomic molecules and use MO diagrams to predict molecular and ionic and magnetic properties and explain spectra.

9. Describe the relationship between pressure, volume, temperature, and number of moles of a gas and calculate changes in quantity when the pressure, volume, or temperature of a gas is varied.

A. Calculate changes in the volume, pressure, temperature and number of moles of a gas using various gas laws including the ideal gas law.
B. Use balanced chemical equations to relate the volume of substances using the stoichiometry of the reaction and the ideal gas law.
C. Calculate the density of a gas, the molar mass of a gas from the ideal gas law.
D. Determine the mole fraction and partial pressure of a gas in a mixture of gases.
E. Use kinetic molecular theory to explain the behavior of gases.
F. Calculate the root mean square speed of a gas and relative rates of effusion and diffusion.
G. Describe and predict the differences between real and ideal behavior of gases qualitatively and using the van der Waals equation.

10. Apply critical thinking skills to solve problems in chemistry.

A. Describe and apply the scientific method and distinguish between scientific laws and theories.
B. Solve various situational, numerically based problems.
C. Apply chemical principles & theories to explain the trends within chemistry.
D. Use chemical principles to correlated scientific phenomena in everyday occurrences.