



Morehead State University - Fall 2011
College of Science & Technology - Reed 245
Department of Biology & Chemistry - Lappin 103

CHEM 111 - Principles of Chemistry I. Fall 2011, 10:20 MWF1. LA 414. Face-to-face
CHEM 111L.-Principles of Chemistry I Lab. Check schedule. LA 445.
You must be currently enrolled in both CHEM 111 and CHEM 111L.

INSTRUCTOR - Dr. Herb Hedgecock
Office Lappin 404D phone 606-783-2928
office hours: MWF 9:10-10:10, MW 1:00-2:00
Department phone 606-783-2945
E-mail: h.hedgoc@moreheadstate.edu

You may leave messages at my campus phone number, at my university e-mail address, or on the notepad on my office door. Call the department phone number only for emergency cases. If you need class help, then I will be more than happy to help you. This can be at regular office hours, at times when you make an appointment, or simply walk in. My office hours are on the outside of my office. I will also be in my office during times other than normal office hours. You may drop by my office at any time.

CHEM 111. Principles of Chemistry I. (3-2-4); I, II. Prerequisite: MATH 152 (or equivalent) or enhanced ACT mathematics score of 20 or higher. An introduction to stoichiometry and chemical equations, electronic structure of atoms and molecules, periodic properties, gases, phase equilibria, and solutions, with laboratory. Primarily for natural science and pre-professional students. This course satisfies the area studies-natural and mathematical sciences for general education. There are no required field experience hours.

“Community Engagement: A Light to and from the Mountains”

The Professional Education Unit at Morehead State University delivers rigorous, high quality programs that prepare professionals informed by best national and international scholarship, plus research, literature, and experiences specific to Appalachia- preparing professionals to improve the schools, quality of life, and the communities in which they live and serve. This statement is not only the strategic mission for the College, but it also incorporates the conceptual framework that guides all our activities.

TEXTS AND SUPPLIES - "Chemistry, A Molecular Approach 2nd ed," Nivaldo Tro (ISBN 978-0-321-65178-5). A lab manual will be sold in Lappin 426 during the first week of class. You will also need a lab apron and safety goggles by the second day of lab. Some data storage device will also be appropriate; a small flash drive or something comparable should do. Bring your lecture book and a calculator to both lecture and lab.

Conceptual Framework Outcomes (CFOs):

The Unit and the faculty within individual programs assess the degree to which its graduates:

- 1) Master the content knowledge, professional and the twenty-first century skills needed to make an optimal contribution to “whole” student learning in educational settings.
- 2) Are competent in the collection and use of data to inform decision-making and to demonstrate accountability for student learning.
- 3) Demonstrate professional dispositions.
- 4) Are culturally competent and understand the regions from which they have come, utilizing knowledge and experiences to effectively “bridge the gaps” (economic, achievement, and geographic) to ensure optimal learning for all students.
- 5) Engage in authentic field experiences in collaboration with committed school-based partners and are empowered to improve the quality of education throughout this region and beyond.

Student Learning Outcomes (SLOs): By the end of the course, the candidate will be able:

1. To describe and apply atomic structure concepts to the particulate nature of matter.
2. To use basic nomenclature rules for inorganic compounds.
3. To apply the conservation of matter.
4. To identify and relate periodic table trends to atomic structure.
5. To articulate relationships between molecular structure, bonding, and intra- and intermolecular forces.
6. To apply mathematical concepts to chemical principles.

NCATE/ EPSB Accreditation Alignment of CFOs and SLOs:

Program:		Secondary Chemistry Education		Principles of Chemistry I	
Aligned with → Assessment (point values) ↓	Kentucky Teacher Standards (KYS)	Kentucky Program of Studies-Science (POS)	Education Professional Standards Board (EPSB)	National Science Teachers Association (NSTA)	NCATE
Test 1, 100 pts CFO: 1 SLO: 1, 2, 3, 4, 6	1	SC-H-STM-U-1 SC-H-STM-S-1 SC-HS-1.1.1 SC-H-STM-U-3	1	1.c.3a.1 1.c.3a.3 1.c.3a.2 1.c.3a.6	1
Test 2, 100 pts CFO: 1 SLO: 2, 3, 4, 5, 6	1	SC-H-STM-S-9 SC-H-STM-U-2 SC-HS-1.1.8	1	1.c.3a.2 1.c.3a.4 1.c.3a.5 1.c.3a.6 1.c.3a.8	1
Test 3, 100 pts CFO: 1 SLO: 1, 2, 4, 5, 6	1	SC-H-STM-S-9 SC-H-STM-U-2 SC-HS-1.1.5 SC-HS-1.1.7 SC-H-STM-U-5 SC-H-STM-S-8 SC-H-STM-S-10 SC-H-STM-U-6 SC-H-STM-S-4	1	1.c.3a.2 1.c.3a.1	1
Test 4, 100 pts CFO: 1 SLO: 1, 2, 3, 5, 6	1	SC-H-STM-U-2 SC-H-STM-U-5 SC-H-STM-S-2 SC-H-STM-S-7 SC-H-STM-S-9 SC-HS-1.1.3 SC-HS-1.1.5	1	1.c.3a.3	1
Final Exam, 100pts CFO: 1 SLO: 1, 2, 3, 4, 5, 6	1	all listed above	1	all listed above	1
Observations & Graphs 100pts CFO: 1 SLO: 6	1	SC-H-STM-S-13 SC-H-STM-U-9 SC-H-STM-S-15	1	1.c.3a.12	1
Data Uncertainty & Graphing 2 Trends 100pts	1	SC-H-STM-S-13 SC-H-STM-U-9 SC-H-STM-S-15	1	1.c.3a.12	1

CFO: 1 SLO: 6					
Qualitative Analysis 100pts CFO: 1 SLO: 1, 2	1	SC-H-STM-U-9 SC-H-STM-S-15	1	1.c.3a.3 1.c.3a.12	1
Separating Mixtures 200pts CFO: 1 SLO: 1, 2, 3, 5	1	SC-H-STM-U-9 SC-H-STM-S-15 SC-H-STM-S-9 SC-H-STM-S-1 SC-HS-1.1.5	1	1.c.3a.3 1.c.3a.12	1
Formula of a Copper Chloride Hydrate 100pts CFO: 1 SLO: 1, 2, 3, 5	1	SC-H-STM-U-9 SC-H-STM-S-15	1	1.c.3a.6 1.c.3a.12	1
Spectrophotometric Determination of Copper in a Penny 100pts CFO: 1 SLO: 1, 3, 4, 6	1	SC-H-STM-U-9 SC-H-STM-S-15 SC-H-STM-S-10	1	1.c.3a.12	1
Solutions & DH_{rxn} MRE 100pts CFO: 1 SLO: 1, 2, 3, 5, 6	1	SC-H-STM-U-9 SC-H-STM-S-15 SC-HS-4.6.1 SC-H-ET-U-2 SC-H-ET-S-9	1	1.c.3a.12 1.c.3a.4	1
Oscillating Reaction 100pts CFO: 1 SLO: 2, 3, 6	1	SC-H-STM-U-9 SC-H-STM-S-15	1	1.c.3a.12 1.c.3a.4	1
Synthesis & Purification of Salicylic Acid 100pts CFO: 1 SLO: 1, 2, 3, 5, 6	1	SC-H-STM-U-9 SC-H-STM-S-15	1	1.c.3a.12	1
Identification of an Unknown by IR Spectroscopy 100pts CFO: 1 SLO: 1, 4, 5	1	SC-H-STM-U-9 SC-H-STM-S-15	1	1.c.3a.12	1
Lewis Structures 100pts CFO: 1 SLO: 1, 2, 4, 5	1	SC-H-STM-U-9 SC-H-STM-S-15 SC-H-STM-S-3 SC-HS-1.1.7	1	1.c.3a.2 1.c.3a.12	1
Acid/Base 200pts CFO: 1 SLO: 1, 2, 3, 6	1	SC-H-STM-U-9 SC-H-STM-S-15	1	1.c.3a.8 1.c.3a.12	1
Gases 100pts CFO: 1 SLO: 1, 2, 3, 5, 6	1	SC-H-STM-U-9 SC-H-STM-S-15 SC-H-STM-S-7	1	1.c.3a.12	1

Assignment Descriptions:

Program:	Secondary Chemistry Education	Principles of Chemistry I
Assessment (point value)	Description	
Test 1, 100pts	1 hour open response, over states of matter, measurements of matter, atomic theory, periodic chart, mole calculations, bonding, nomenclature	
Test 2, 100pts	1 hour open response, over mole calculations, solutions, solubility, acid/base neutralization, redox reactions, enthalpy changes	
Test 3, 100pts	1 hour open response, over electron configuration, periodic table trends, covalent bonding & structure, polarity	
Test 4, 100pts	1 hour open response, over intermolecular forces, macroscopic properties of matter, phase changes, solutions, colligative properties, kinetic molecular theory of gases, gas laws	
Final exam, 100pts	Final exam is comprehensive, multiple choice	
Lab Reports, ~25-100pts each	Data acquisition, appropriate data analysis, and evidence based conclusion	
Homework, ~10-80pts each	Practice problem solving (for example: .predicting precipitation reactions)	
Quizzes, ~5-15pts each	Reading comprehension quizzes, vocabulary and conceptual understanding	

GRADING - Understand that you are not being graded on effort. Working hard in this class is expected, but that does not necessarily mean that you should expect a good grade simply because you work hard. Your grade will be based on your mastery of the subject material, and your ability to show that you can relate that mastery to me.

You will be assured of making the following grade if the weighted average of both your class lecture and lab averages is at least equal to or above the following: 85 - A; 75 - B; 65 - C; 55 - D

You will not be allowed to pass the course if either of the class grades (lab or lecture) is below a 55%. Missing more than three lab assignments will result in a failing grade for the class. Your grade will be calculated using the following: Lab:25%; Lecture:75%; Total:100%

Failure to turn in any part of the assigned lecture or lab work will result in a "zero" grade.

The lecture grade will consist of the following: a.) announced exams - 33%, b.) in-class quizzes on reading assignments - 14%, c.) homework - 10%, d.) comprehensive final - 18%.

For the announced exams and the final, you will be provided a non-graphing, non-programmable calculator for your own use.

The intent is to cover twelve chapters (1-12) for the lecture part of this course. After having covered about two to three chapters of new material, you should expect a one-hour exam over this material. These exams will be comprehensive. They will certainly focus on the material most recently covered. However, if you are unaware, the understanding of chemistry you are currently learning depends upon your understanding what you have previously learned. You simply cannot forget earlier material and expect to do well on new topics. The best way to learn the material is by doing all of the homework problems at the end of each chapter. I really doubt that anyone will do this.

If you add up all of the lecture grades, divide by their total worth, and scale to 100%, then you will know your lecture average.

Each lab report is weighted according to its difficulty/lab-time towards the overall lab grade. Each lab report should be typed (computer labs in Lappin 442 as well as the library are available for typing) and turned in on the first lab day of the week after the lab was completed. There is a printer available in Lappin 442. Any variation on this will be noted in class.

ATTENDANCE: Lecture - You are expected to be in class and on time. The instructor will not tolerate any person who makes a habit of coming to class late or who does not attend class. Lab attendance is mandatory.

Make-up work for excused absences will be given only when the student documents that the absence is excused or discusses it with the instructor, and that the student does this within a reasonable amount of time. You are responsible for documenting any University excused absences. You are responsible for any work missed during

an absence. Assignments which you do not turn in on time will receive "zero" grades. Late work will not be accepted without discussing this with the instructor.

You are expected to have read this syllabus and to agree to abide by it. If you are unclear about anything on this syllabus or concerning the class, then it is your responsibility to find out the answer. Your teacher is more than willing to help you. The teacher reserves the right to make modifications to this syllabus if needed after discussing the changes with the class.

ACADEMIC HONESTY - All work that you turn in for a grade is expected to be done by you. This work is to be original and performed by you. Copying work, in part or whole from other persons/sources, is considered unethical and cheating by the instructor. Any student whose work is suspect will face loss of grade for that work the first time and possibly will face expulsion from the class depending on the severity/repetition of cheating. If you are not sure what constitutes academic dishonesty, read The Eagle: Student Handbook or ask your instructor. The policy is located at <http://www.moreheadstate.edu/units/studentlife/handbook/academicdishonesty.html> .

Americans with Disabilities Act (ADA)

In compliance with the ADA, all students with a documented disability are entitled to reasonable accommodations and services to support their academic success and safety. Though a request for services may be made at any time, services are best applied when they are requested at or before the start of the semester. To receive accommodations and services the student should immediately contact the Disability Services Coordinator in the Office of Academic and Career Services, 223 Allie Young Hall, 606-783-5188, www.moreheadstate.edu/acs/

Campus Safety Statement:

Emergency response information will be discussed in class. Students should familiarize themselves with the nearest exit routes in the event evacuation becomes necessary. You should notify your instructor at the beginning of the semester if you have special needs or will require assistance during an emergency evacuation. Students should familiarize themselves with emergency response protocols at <http://www.moreheadstate.edu/emergency>

CLASSROOM ETIQUETTE: The classroom should be a place for learning. You should help to keep the atmosphere of the class like this. Be in class on time. If you must be late, then try to be quiet when entering the room. Refrain from excess chatter when class is in progress, and especially when others have the floor. Eat, sleep, groom, court, and gossip somewhere other than in class. By all means get involved in class discussions and work. Inaction is a lost opportunity for learning. Your actions and words towards others should be respectful, polite, and civil. The instructor reserves the right to tell a student to leave the class if the student is disruptive or is not showing good etiquette. Cell phones, pagers, watch alarms, and such are to be turned off during lecture and lab.

Lecture Schedule

1	Aug 23	M	Placement exam, introduction	pp = pages, Pr = problems
2	Aug 25	W	Ch 1, submicroscopic, atoms, molecules, empirical/experimental, hypothesis, law, theory, model, states of matter, solid, liquid, gas, elements, compounds, substances, mixtures, heterogeneous, homogeneous, physical vs chemical properties and changes,	pp 1-11. Pr 4, 8-13, 18, 41, 49, 137-8, 142
3	Aug 27	F	intensive vs extensive, energy, measurements, units, meter, kilogram, second, kelvin, mole, giga, mega, kilo, deci, centi, milli, micro, nano, pico, derived units, density, volume, conversions, reliability, precision, accuracy	pp. 12-26, Pr 20-25, 30, 53, 55, 57, 63-4, 112, 141
4	Aug 30	M	chemical calculations	pp. 27-35. Pr 65, 69, 73-4, 89, 91, 98, 101, 121, 123, 125-6
5	Sept 1	W	Ch 2, atoms, atomic theory, conservation of mass, law of definite proportions, law of multiple proportions, subatomic particles, protons, neutrons, electrons, nucleus, amu, charge, atomic number, mass number, isotopes, symbols	pp. 43-57, Pr 2-13, 15, 17-9, 33, 35, 39-42, 45, 51, 93, 99, 103
6	Sept 8	W	periodic law, periodic chart, groups, periods, metals, nonmetals, metalloids, representative elements, transition elements, noble gases, alkali metals, alkaline earth metals, halogens, chalcogens, cation, anion	pp. 57-63, Pr 19-23, 57, 59-68
7	Sept 10	F	atomic mass, molar mass (molecular weight), mole, avogadro's number, mol \Leftrightarrow mass conversions	pp. 64-72, Pr 24-5, 72, 77, 81, 109
8	Sept 13	M	Ch 3, elements vs atoms, compounds vs molecules, covalent and ionic bonds, empirical formula, molecular formula, structural formula, ball/stick and space-filling models, molecular vs atomic elements, diatomic, molecular formula vs formula unit, nomenclature \Leftrightarrow formulas, ionic nomenclature, charges, polyatomic ions, hydrates, molecular, acids, oxy acids,	pp. 78-97, Pr 1-11, 16, 23, 25-33, 35, 37, 39, 41, 45, 47, 49, 51
9	Sept 15	W	moles, molar mass (molecular weight), % composition, empirical vs molecular formula, combustion analysis	pp. 97-110, Pr 55, 57, 67, 69, 73, 81, 87, 90
10	Sept 20	M	Chemical equations/reactions, coefficients, "g \Leftrightarrow mol \Leftrightarrow mol \Leftrightarrow g conversions"	pp. 110-119. Pr 75, 93, 95, 98-9, 101
11	Sept 22	W	exam 1	
12	Sept 24	F	Ch 4, stoichiometry, "g \Leftrightarrow mol \Leftrightarrow mol \Leftrightarrow g conversions", limiting reactant, theoretical yield, % yield,	pp. 127-139, Pr 1-3, 27, 31, 39, 45, 49, 101, 111, 133
13	Sept 27	M	solutions, molarity, "vol \Leftrightarrow M \Leftrightarrow mol \Leftrightarrow mol \Leftrightarrow g conversions", dilutions, electrolytes, non-electrolytes, precipitation, solubility rules, molecular vs ionic vs net ionic reactions	pp. 140-155, Pr 4-6, 12-3, 53, 57, 59, 61, 69, 73, 75, 107, 115, 132
14	Sept 29	W	acid-base neutralization, gas formation, Arrhenius a/b, protic, titration, end point, equivalence point, redox reactions, oxidation numbers, oxidized/reduced, oxidizing agent/reducing agent, combustion	pp. 155-171, Pr 7, 14, 22-4, 83, 91, 93, 99
15	Oct 4	M	Ch 6, thermochemistry, energy, kinetic/potential, heat, law of conservation of energy, system/surroundings, $J=(kg \cdot m^2/s^2)$, cal, kWh, first law of thermodynamics, state function, ΔE , heat capacity, specific heat capacity, molar heat capacity, calorimetry, $q=m \cdot C_s \cdot \Delta T$, PV work $w=-P\Delta V$, enthalpy change $\Delta H = \Delta E + P\Delta V \approx q_p$, endothermic, exothermic, ΔH_{rxn} ,	pp. 231-251, Pr 3-10, 20-1, 33, 47, 55, 57-8, 65, 71, 115, 133

16	Oct 6	W	coffee-cup calorimeter, ΔH_{rxn} , thermochemical equation manipulations, Hess's law, standard heat (enthalpy) of formation ΔH_f° , heat of combustion $\Delta H_{\text{comb}}^\circ$, $\Delta H_{\text{rxn}}^\circ = \sum n_p \Delta H_f^\circ (\text{products}) - \sum n_r \Delta H_f^\circ (\text{reactants})$	pp. 251-263, Pr 19, 25, 27-9, 77-81, 85, 89, 99, 111
17	Oct 8	F	energy use, review	pp. 263-268, Pr 30-2, 91, 93, 94
18	Oct 11	M	review	
19	Oct 13	W	exam	
20	Oct 18	M	Ch 7, quantum mechanics, wave-particle duality of light, electromagnetic radiation, amplitude/intensity, wavelength= λ (lambda), frequency= ν (nu), $\lambda\nu=c$ (speed of light= 3.0×10^8 m/s, Hertz (Hz)), electromagnetic spectrum, photoelectric effect, photons/quanta, $E=h\nu=hc/\lambda$ (h =Planck's constant = 6.626×10^{-34} J.s), atomic emission spectrum, orbital, principal quantum number (QN) ($n=1,2,3, \dots$), angular momentum QN ($l = 0,1,2,3, \dots, n-1$), $l=s, 2=p, 3=d, 4=f, 5=g$, magnetic QN ($m_l = -l, \dots, +l$), ground state, excited states, orbital shapes, representative vs transition elements	pp. 277-291, 297-310, Pr 4-6, 29-32, 37-8, 41-2c, 47-8, 75-6, 97, 101, 104, 106
21	Oct 20	W	Ch 8, periodic table, electron configuration for atoms and ions, Pauli exclusion principle, spin QN, effective nuclear charge, valence electrons, half-filled orbitals, electron configuration and charge	pp. 314-330, Pr 6-19, 24-5, 43-52b, 55, 57, 61
22	Oct 25	M	periodic trends, van der Waals radius, covalent radius, atomic radius, effective nuclear charge, paramagnetic, diamagnetic, ionic radius, isoelectronic, ionization energies, electron affinity, periodic chemical behavior	pp. 330-346, Pr 28-39, 57, 59, 61, 63, 65, 67, 69, 71, 75, 77, 91, 93, 99, 103, 119, 132
23	Oct 27	W	Ch 9, Lewis structure, Coulomb's law, bonding: ionic, covalent, metallic, lattice energy, Born-Haber cycle, ion size, ion charge	pp. 359-369, Pr 7-11, 37, 41, 43, 47,
24	Oct 29	F	covalent bond, multiple bonds, molecular substance, electronegativity, bond polarity, dipole moment, % bond character, polyatomic ions, resonance, formal charge, exceptions to the octet rule, radicals, incomplete octets, expanded octets, bond energy-average vs exact, bond length, enthalpy change, metallic bond	pp. 374-393, Pr 49, 51, 53, 55, 57, 63, 65, 69, 71, 73, 75, 77, 91, 93, 97, 109
25	Nov 1	M	Ch 10, VSEPR theory, geometries - linear, trigonal planar, tetrahedral, trigonal bipyramidal, octahedral, bond angles, lone electron pair, angular ($\sim 120^\circ$), trigonal pyramidal, angular ($\sim 109^\circ$), seesaw, T-shape, linear, square pyramidal, square planar,	pp. 399-412, Pr 3, 5-6, 31-42,
26	Nov 3	W	shape and molecular polarity, sp , sp^2 , sp^3 , dsp^3 , d^2sp^3 , σ bond (sigma), π bond (pi),	pp. 412-432, 445-446, Pr 47-50, 52, 57-9, 65, 86-7, 94
27	Nov 8	M	exam	
28	Nov 10	W	Ch 11, intermolecular forces, intramolecular, states of matter, crystalline vs amorphous, phase change, dispersion (London), dipole-dipole, hydrogen bonding, instantaneous dipole, shape and size effect, permanent dipoles, polarity and miscibility, polarity vs boiling temperature, ion-dipole forces	pp. 455-467, Pr 3-14, 49-52, 55-6, 59, 119
29	Nov 12	F	surface tension, viscosity, capillary action, vapor pressure, heat of vaporization, boiling point, critical temperature and pressure, sublimation/deposition, fusion (melting/freezing),	pp. 468-488, 503-504, Pr 15-7, 20, 25, 27-9, 31-4, 63, 65, 71, 81, 85, 91-4,

			heating curves, phase diagrams, triple point, phase equilibrium curves	125, 155
30	Nov 15	M	Ch 12, solution, solute, solvent, aqueous, solubility, intermolecular forces, concentrations, colligative properties	pp. 513-538, 542-555, Pr 2, 12, 16, 22, 24, 29, 33, 43, 51, 57, 59, 63, 69, 85,
31	Nov 17	W	review	
32	Nov 22	M	Ch 5, $PV=nRT$, ideal gases, pressure, manometer, Boyle, Charles, Avogadro, Gay-Lussac, STP, molar volume, Kelvin, $n/V=P/RT$, $d=P\mathcal{M}/RT$, partial pressure, $\mathcal{M}=mRT/PV$, vapor pressure	pp. 179-202. Pr 31, 33, 51, 55, 59, 61, 67, 69, 109, 115, 125
33	Nov 29	M	kinetic-molecular theory,	pp 206-212. Pr 83-4, 87, 91-5
34	Dec 1	W	exam	
35	Dec 3	F	Gas stoichiometry, $u_{rms}=(3RT/\mathcal{M})^{1/2}$, diffusion, effusion, real gases, $[P + a(n/V)^2][V-nb]=nRT$	pp. 203-205, 212-222, 220-224, Pr , 77, 79, 81, 103, 121, 136
36	Dec 6	M	Solids	pp 497-500. Pr 105-10,
37	Dec 8	W	review	
38	Dec 16	Th	Final - 10:15	