Ch 221 **General Chemistry** **Fall 2012**

Gilbert 3rd Ed.

The assessment form in this course was based upon a selected number of ***learning outcomes*** (see the attached) and students' performance on the laboratory reports, final lab exam, first midterm, second midterm, and the final comprehensive examination.

- Graded on a 100-point scale, for this assessment students scoring 75 or higher on the midterms demonstrated competence on the learning outcomes.
- The average score on the first exam was 58.5 while the highest score was 89.
- The average score on the second midterm was 62.0 while the highest score was 97.
- The average score on the final was 52.8 while the highest score was 87.

Ch 223 **General Chemistry** **Fall 2012**

Gilbert 3rd Ed.

The assessment form in this course was based upon a selected number of ***learning outcomes*** (see the attached) and students' performance on the laboratory reports, final lab exam, first midterm, second midterm, and the final comprehensive examination.

- Graded on a 100-point scale, for this assessment students scoring 75 or higher on the midterms demonstrated competence on the learning outcomes.
- The average score on the first exam was 58.2 while the highest score was 88.
- The average score on the second midterm was 58.3 while the highest score was 86.
- The average score on the final was 51.9 while the highest score was 73.

Ch 360 **Nuclear Chemistry** **Fall 2012**

W.D. Ehmann

The assessment form in this course was based upon a selected number of ***learning outcomes*** (see the attached) and students' performance on the first midterm, second midterm, and the final comprehensive examination.

- Graded on a 100-point scale, for this assessment students scoring 75 or higher on the midterms demonstrated competence on the learning outcomes.
- The average score on the first exam was 87.0 while the highest score was 95.
- The average score on the second midterm was 80.7 while the highest score was 84.
- The average score on the final was 78.3 while the highest score was 90.

Ch 222 **General Chemistry** **Winter 2012**

Gilbert 3rd Ed.

The assessment form in this course was based upon a selected number of ***learning outcomes*** (see the attached) and students' performance on the laboratory reports, final lab exam, first midterm, second midterm, and the final cumulative examination.

- Graded on a 100-point scale, for this assessment students scoring 75 or higher on the midterms demonstrated competence on the learning outcomes.
- The average score on the first exam was 67.0 while the highest score was 88.
- The average score on the second midterm was 65.3 while the highest score was 91.
- The average score on the final was 59.4 while the highest score was 92.

Ch 223 **General Chemistry** **Spring 2012**

Gilbert 3rd Ed.

The assessment form in this course was based upon a selected number of ***learning outcomes*** (see the attached) and students' performance on the laboratory reports, final lab exam, first midterm, second midterm, and the final cumulative examination.

- Graded on a 100-point scale, for this assessment students scoring 75 or higher on the midterms demonstrated competence on the learning outcomes.
- The average score on the first exam was 58.5 while the highest score was 96.
- The average score on the second midterm was 57.7 while the highest score was 97.
- The average score on the final was 55.9 while the highest score was 88.

Ch 340 **Elements of Physical Chemistry** **Spring 2012**

Atkins, 5th. Ed.

The assessment form in this course was based upon a selected number of ***learning outcomes*** (see the attached) and students' performance on the laboratory reports, final lab exam, first midterm, second midterm, and the final cumulative examination.

- Graded on a 100-point scale, for this assessment students scoring 75 or higher on the midterms demonstrated competence on the learning outcomes.
- The average score on the first exam was 66.6 while the highest score was 79.
- The average score on the second midterm was 63.8 while the highest score was 77.
- The average score on the final was 59.3 while the highest score was 73.

Ch 221

The following items were used on the quizzes, midterms, and the final exam as the LEARNING OUTCOMES for this course.

1. Distinguish between the chemical change, physical change or physical versus chemical property.
2. Recognize the mixtures versus compounds, homogeneous versus heterogeneous solution.
3. Classify matter as an element, molecule, substance or a compound.
4. Give the SI base units, some common SI prefixes with their associated decimal multipliers.
5. Convert between the metric and the British systems given the appropriate conversion factors.
6. Convert among Fahrenheit, Celsius and Kelvin temperatures.
7. Solve problems involving the density, mass and volume.
8. Recognize the intensive from the extensive properties.
9. Perform mathematical operations (+/– or × / ÷) with the correct number of significant figure
10. Understand the difference between accuracy and precision.
11. Provide the statements of Dalton's atomic theory and the fundamental chemical laws.
12. Show the validity of the law of conservation of matter, the law of definite composition (proportions) and the law of multiple proportions from the experimental data.
13. Define radioactivity, characteristic properties of alpha, beta and gamma radiations and their identity.
14. Differentiate and distinguish atomic number, atomic mass, mass number, isotopic mass, and amu.
15. Give the number of neutrons, protons and electrons for a given isotope (e.g. ^{14}C).
16. Calculate the atomic mass of an element from its isotopic abundance and the isotopic mass or find the isotopic abundance from the atomic mass and its isotopic mass.
17. Use the periodic table to identify *groups, periods, metals, metalloids, nonmetals, alkali metals, alkaline earth metals, halogens, noble gases and transition elements.*
18. Understand ions (cations and anions), ionic compounds.
19. To name (or write the formulas) mono and polyatomic anions, specifically, tables 2.2 and 2.3.
20. Understand the mole concept and use mole to solve chemical problems.
21. Convert grams to moles to number of atoms (or molecules) and vice versa.
22. Understand the empirical, molecular and structural formulas.
23. Understand molar mass of an element or a compound and calculate the molar mass from the atomic masses.
24. To calculate the percent composition from the molecular formula or to obtain the empirical formula from percent composition. Also, given the molecular weight, find the molecular formula.
25. Use experimental data to calculate the number of water molecules in a hydrated compound.
26. Solve problems involving mass relationships between the reactants and the products.
27. To balance simple chemical reactions as discussed in lecture.
28. Complete and balance combustion reactions.
29. Relate reactant mass to the product mass, simple stoichiometry.
30. Use the nomenclature to name a chemical compound given the formula and vice versa.
31. Solve problems involving, limiting reagent, % yield calculations.
32. Name and distinguish an electrolyte from a nonelectrolyte, strong from weak.

33. Name strong acids and bases.

34. Write the net ionic equations by applying the solubility rules to these reactions.
35. Distinguish the soluble from insoluble compounds.
36. Recognize the monoprotic, diprotic and triprotic acids and give examples for these acids.
37. Explain acids or bases according to Arrhennius or Brønsted definitions.
38. Complete and balance chemical reactions and their classifications.
39. Classify different types of reactions and be able to recognize the redox reactions, assign the oxidation number, identify the element reduced/oxidized , reducing/oxidizing agents.
40. Balance the redox equations in acidic solutions.
41. Solve problems involving molarity (M) including dilution, preparation of solution with a specified concentration as discussed in class.
42. Solve titration problems involving redox, acid-base or gravimetric analysis. See the handout.
43. Distinguish various forms of kinetic/potential energy, their classification and the units.
44. Use the first law of thermodynamic. Calculate work, w, heat, q, internal energy change, ΔE.
45. Solve calorimetry problems involving specific heat, heat capacity, q, ΔH, and temperature.
46. Use Hess's law to calculate ΔH for a specified reaction given ΔH's for other reactions.
47. Identify the state functions.
48. Use the heat of formation of substances, $\Delta H_f°$, to calculate the heat of a reaction or vice versa.
49. Understand the difference between the endothermic and exothermic reactions.
50. Understand the heat of solution, ΔH_{soln} , lattice energy (U), and heat of dilution.
51. Define node, frequency, wavelength and amplitude.
52. Rank the various regions of the electromagnetic spectrum according to their energies.
53. Calculate frequency, wavelength, and energy of electromagnetic radiation, Planck's equation.
54. Explain the photoelectric effect and the wave-particle duality (de Broglie equation).
55. Explain terminologies such as: ground state, excited state, and line spectrum.
56. Obtain the total number of emission lines possible from a given set of energy levels.
57. Calculate the energy of an electron at any level (orbit) according to the Bohr's model.
58. State the uncertainty principle.
59. Use quantum numbers and give the possible allowed values associated with each.
60. Sketch and identify the shapes of a given s, p, and d orbitals.
61. Give the number of spherical nodes associated with the s-orbitals.
62. Choose the paramagnetic/diamagnetic atoms.
63. To write out the electron configuration ($1s^2 2s^2$…..) for elements.
64. Give the orbital box diagram designations for both atoms and ions as discussed in lecture.
65. Explain the Hund's rule and the Pauli Exclusion Principle.
66. Decide which set of quantum numbers are acceptable.
67. Understand the shielding effect in many-electron atoms.

Ch 223 **General Chemistry** Gilbert 3rd Ed.

The following items were used on the quizzes, midterms, and the final exam as the LEARNING OUTCOMES for this course.

1. Understand collision theory, activation energy, temperature effect and the Arrhenius equation.
2. Understand catalysis, homogeneous and heterogeneous catalysts.
3. Understand the reaction mechanisms, molecularity, elementary steps, rate determining step and identify the intermediate(s), and the catalyst.
4. Determine the rate law from the proposed mechanism(s).
5. Calculate the activation energy from rate constants and temperature changes.
6. Determine a plausible mechanism consistent with the observed rate law.
7. Solve problems involving the first and the second order reactions.
8. Relate the rate of formation of a product to the rate of consumption of a reactant or vice versa.
9. Determine the rate law using the initial rate method.
10. Write the equilibrium constant expression for all chemical reactions involving solid, liquid and gas.
11. Tell the relationship between the chemical reaction (as written) and its equilibrium constant (K_p or K_c)
12. Understand the significance of the magnitude of the equilibrium constant, too large or too small.
13. Understand the reaction quotient, Q, and its relationship to the equilibrium constant (K_c or K_p).
14. Perform the equilibrium calculations. See the separate hand out given in class.
15. Understand the ***Le Châtelier's Principle*** and its application in chemical equilibria. Specifically, predict the direction of shift in equilibrium as we change the conditions such as concentration, temperature, pressure, etc.
16. Tell the various definitions of acids and bases.
17. Give examples of a monoprotic, diprotic and triprotic and amphiprotic substances.
18. Give the conjugate acid given the conjugate base and vice versa.
19. Understand the relationship between the strength of an acid and its ionization (dissociation) constant (K_a).
20. Rank both the binary acids and oxoacids according to their strength.
21. Use relative acid-base strengths to predict the direction of acid - base equilibrium reactions.
22. Use K_w, K_a, K_b and the pH scale in various chemical calculations involving weak acids or bases. Specifically, finding K_a from pH or pH from K_a. Also learn the examples worked out in class. See the note below.
23. Understand ***hydrolysis*** and be able to write hydrolysis reactions for different species.
24. Understand the role of the molecular structure and the acid - base strength (inductive effect).
25. Identify Lewis acid or a Lewis base in an acid-base reaction.
26. Identify buffer solutions and understand their properties such as the capacity.
27. Tell the buffer range for a buffer system.
28. Calculate the pH of any buffer solution.
29. Prepare a buffer solution with a specific pH.

30. Calculate the new pH of a buffer solution after a small amount of acid (or base) has been added.
31. Choose an appropriate indicator from a table for a given acid-base titration reaction.
32. Calculate the pH at any point in an acid-base titration. This includes strong acid-strong base, weak acid-strong base and weak base-strong acid only.
33. Write the K_{sp} expression for all slightly soluble salts (used to be insoluble salt).
34. Calculate the K_{sp} from the solubility data or the solubility from the K_{sp} values.
35. Calculate the solubility of a salt in the presence of the common ion.
36. Recognize the solubility of slightly soluble salts containing basic anions in acidic or basic solutions. That is, the dependency of the solubility upon pH.
37. Decide whether a precipitate forms when the two respective aqueous solutions are mixed.
38. Estimate the relative solubilities from K_{sp}'s of similar salts. No calculation required here.
39. Predict the sign of the entropy change without calculation for simple reactions.
40. Explain the Second Law and the Third Law of thermodynamics.
41. Calculate the entropy change for a chemical reaction from the known molar entropies, S°.
42. Calculate the entropy change for phase transition from the available data.
43. Understand the principle concept of "coupled *reactions*".
44. Calculate the free energy change for a chemical reaction from)G_f°.
45. Calculate the (minimum) temperature at which the reaction becomes product favored (i.e. spontaneous)
46. Associate the equilibrium constant (K) with the free energy of the reaction,)G°.
47. Understand the difference between)G° and)G and their association with K_{eq}.
48. Identify the anode, cathode, oxidation, reduction, electrolyte solutions, polarity, and direction of current (electron flow) in a voltaic or an electrolytic cell.
49. Balance the redox equations both in acidic or basic solutions.
50. Relate E°of the cell to)G°.
51. Calculate the cell potential (cell voltage) using the Nernst equation.
52. Use the table of standard reduction potentials; decide the strongest (or weakest) reducing agent, strongest (or weakest) oxidizing agent.
53. Tell whether or not the reaction is product-favored.
54. Calculate the equilibrium constant from electrochemical information such as E°.
55. Recognize and appreciate the difference between primary and secondary batteries, their advantages or disadvantages.
56. Understand the fuel cells, their benefits and their principal mode of operations.
57. Recognize the corrosion process, in particular, cathodic protection.
58. Identify the reactions that occur during the electrolysis of molten salt versus aqueous salt solution.
59. Tell the differences between nuclear reactions and the chemical reactions.
60. Identify various decay modes in nuclear reactions (α, β, γ, ….) and complete these reactions for the missing particle.
61. Calculate the binding energy associated with a given nuclide.
62. Explain fission and fusion processes.
63. Explain the radiocarbon dating and be able to apply the integrated (first-order) rate law to solve problems involving radioactive isotopes.

Ch 360 Nuclear Chemistry Fall 2012

The following items were used on the midterms, and the final exam as the LEARNING OUTCOMES for this course.

1. Be able to name the four basic forces in nature.
2. Be familiar with nuclear vocabulary and classification of nuclides such as mass number, atomic number, isotope, isobar, isotone, metastable state, etc.
3. Be familiar with subatomic particles such as neutrinos, quarks, leptons, hadrons, etc.
4. Be familiar with the chart of nuclei and decay scheme.
5. Understand the Geiger-Nuttall rule as it relates to alpha particle decay and its energy spectrum.
6. Be able to calculate the recoil energy associated with the alpha decay.
7. Understand the theory behind β^{-} and β^{+} decays and the energy spectra for these particles.
8. Understand the electron capture (EC) decay, fluorescence yield versus the Auger yield.
9. Tell the difference between the neutrinos involved in EC versus those in other β- decays.
10. Explain pure gamma-ray emission, internal conversion, and pair production.
11. Be able to interpret the branching decays and the decay schemes.
12. Understand the spontaneous fission decay, delayed-neutron emission, delayed-proton emission, double-beta decay.
13. Understand mass-energy relationships, nuclear density, and the nuclear potential.
14. Understand the nuclear properties, namely, angular momentum, magnetic moment, parity, symmetry, and nuclear spin.
15. Be familiar with models of nuclear structure, namely, shell model, Fermi gas model, liquid drop model, optical model, and the collective model.
16. Be able to carry out mass-energy calculations in various decay processes.
17. Understand the semiempirical binding energy equation.
18. Understand types of nuclear reactions, namely, scattering (elastic/inelastic), stripping, pick up reactions.
19. Understand the energetics of nuclear reactions and be able to apply momentum correction, coulomb barrier correction.
20. Understand the quantum-mechanical tunneling effect related to alpha decays.
21. Understand the cross section for nuclear reaction and how to measure the cross section, specifically, for thin and thick targets.
22. Explain the excitation functions for neutrons and charged particles such protons.
23. Be familiar with reaction mechanisms, namely, compound-nucleus formation, direct interactions.
24. Understand neutron-induced fission reactions, fusion, and heavy-ion reactions.
25. Understand the rates of radioactive decay and half-life.
26. Name the units commonly used in radioactive decay.
27. Understand the experimental methods for determining of half-life. Specifically, specific activity method, delayed coincidence, Doppler shift method and estimation of half-life from theory and systematics using Fermi theory of beta decay.
28. Understand transient equilibrium versus secular equilibrium.
29. Understand various modes of interaction with matter including ionization, kinetic energy transfer, molecular/atomic excitation, nuclear reactions and radiative processes.

30. Be familiar with terms such as Bremsstrahlung radiation and Cerenkov radiation.
31. Understand the gamma-ray interactions, namely, photoelectric effect, Compton scattering and pair production.
32. Understand neutron interactions and its application.
33. Explain the physical effects of radiation on matter.

Ch 222 **General Chemistry** **Winter 2012**
Gilbert 3rd Ed.

The following items were used on the quizzes, midterms, and the final exam as the LEARNING OUTCOMES for this course.

1. Give the number of valence electrons associated with each element (only the main groups).
2. Define free radical, isoelectronic species and give examples of each.
3. Rank the polarity of chemical bonds.
4. Use the atomic or ionic trends to rank them according to their size and their ionization energies.
5. Answer question regarding the chemical properties, completing chemical reactions associated with the elements, oxides, etc. (descriptive chemistry).
6. Give examples of various oxides and their reaction with water.
7. Draw the Lewis electron (dot) structures for atoms, ions and molecules.
8. Identify polar or nonpolar species.
9. Define lattice energy , choose ionic compound with higher lattice energy, higher melting point or/and greater solubility
10. Use the Born– Haber cycle to calculate the electron affinity, ionization energy, lattice energy, sublimation energy, ... and the heat of formation.
11. Tell the difference between electronegativity and electron affinity.
12. Calculate the formal charge and be able to choose the most important Lewis or resonance structure.
13. draw the resonance structures for a given ion or molecule.
14. Use bond energies to calculate the heat of a reaction (ΔH) or given the heat of a reaction find the bond energy.
15. Use the VSEPR theory to assign electron geometry and the molecular geometry (shape).
16. Use the valence bond theory to describe bonding or assign the hybridization to the central atom.
17. Use the MO theory to explain molecular properties such as paramagnetic, diamagnetic species, bond order, bond length, and stability.
18. Understand the delocalized molecular orbitals.
19. Use Valence Bond Theory to describe bonding in molecules containing multiple bonds.
20. Use Molecular Orbital Theory to explain the molecular properties such as bond order, magnetic property, bond length, and bond energy in diatomic molecules or ions.
21. Understand gas laws and use the related equations to solve problems involving pressure, volume, temperature, density, molecular weight, and the gas stoichiometry.
22. Understand Dalton's Law of partial pressures and mole fractions, specifically collection of a gas over water.

23. Understand the Kinetic Molecular Theory of gases, distribution of molecular speed, root-mean-square speed (u_{rms}), diffusion rate and its relation to molecular weight and associated calculations.
24. Intermolecular forces and their strength in liquids. Name the strongest intermolecular force in a given liquid.
25. Choose compound with higher boiling point based upon the strength of their intermolecular forces.
26. Draw H–bonds for molecules capable of forming hydrogen bonds.
27. Explain the properties of liquids, namely surface tension, viscosity, vapor pressure, boiling point and their relationship with the intermolecular forces.
28. Interpret the phase diagrams. Cooling curves and their interpretations.
29. Relate ΔH_{vap}, with ΔH_{fus} and ΔH_{sub}, ...
30. Solve problems involving the Clausius – Clapeyron equation.
31. Understand crystals forming the cubic unit cells and be able to solve problems involving density, edge length, radius, number of atoms per unit cell, atomic weight, ...
32. Understand different types of crystals and their general properties. Be able to give an example. See table 11.4.
33. Use Henry's law in order to determine the solubility of gases in a solvent.
34. Use colligative properties (vapor pressure lowering , Raoult's law, freezing point depression, ..) to solve the related problems. This includes determination of molar mass, boiling point and the freezing point, mass of the solute, ...
35. Determine the van't Hoff factor, *i*, or to apply this factor to a solution of an electrolyte.
36. Understand collision theory, activation energy, temperature effect and the Arrhenius equation.
37. Understand catalysis, homogeneous and heterogeneous catalysts
38. Understand the reaction mechanisms, molecularity, elementary steps, rate determining step and the intermediate(s).
39. Determine the rate law from the proposed mechanism(s).
40. Determine a plausible mechanism.

Ch 340 **Elements of Physical Chemistry** **Spring 2012**

P. Atkins 5th Ed.

The following items were used on midterms, and the final exam as the LEARNIG OUTCOMES for this course.

1. Explain the differences between gases, liquids, and solids.
2. Define the terms: force, work, energy, kinetic energy, and potential energy.
3. Distinguish between mechanical and thermal equilibrium.
4. Identify whether properties (such as, volume, density, mass, temperature,…) are extensive or intensive.
5. Explain how the experiments of Boyle, Charles, and Avogadro led to the formulation of the ideal gas equation.
6. Explain the term “partial pressure” and why Dalton’s law is a limiting law.

7. Be able to calculate molar mass, density, and partial pressures.
8. Be able to calculate ΔH, ΔU, q, w, for various processes, namely, phase change, heating at constant pressure (or volume), isothermal reversible, adiabatic reversible expansion (or compression).
9. be able to apply the Second Law of Thermodynamics.
10. Be able to calculation of ΔS for various processes involving perfect gases. This includes, constant-pressure heating, reversible phase change, etc.
11. Provide a molecular interpretation for the variation of the rates of effusion of gases with temperature.
12. Explain the significance of the critical constants (T_c, P_c).
13. Describe the Joule-Thomson effect and its application to the liquefaction of gases.
14. Be able to apply the gas law equations including the van der Waals equation for real gases.
15. Understand the Kirchhoff's law and the temperature dependence of reaction heats.
16. Be able to estimate ΔH° using bond energies.
17. Understand the Third Law of Thermodynamics.
18. Be able to calculate ΔU for a reaction from adiabatic bomb calorimeter.
19. Understand the Nernst-Simon entropy statement and the unattainability of absolute zero.
20. Calculation of ΔH from ΔU and vice versa for a chemical reaction.
21. Explain the difference between expansion work against constant pressure and work of reversible expansion and their consequences.
22. Be able to explain the standard state of a substance in solid, liquid and gas.
23. Be able to explain the Hess's law or apply the law in solving the related problems.
24. Recognize the state functions.
25. Understand that at constant T and P, a system tends to change in the direction of decreasing Gibbs energy.
26. Be able to calculate ΔS, ΔH, and ΔG from the table of thermodynamic data.
27. Explain the significance of the Clapeyron equation and of the Clausius-Clapeyron equation.
28. Be able to use the Clausius-Clapeyron equation in solving problems associated with this equation.
29. Understand the phase diagrams.
30. Understand the phase rule and be able to calculate the number of degrees of freedom of a given system.
31. Explain how a reaction that is not spontaneous may be driven forward by coupling it to a spontaneous reaction.
32. Be able to apply the Le Chatelier's principle to various chemical systems.
33. Be able to use the van't Hoff equation in solving problems.
34. Understand thermodynamic variable that can or cannot change the equilibrium constant.
35. Understand the difference among the rate, the rate law and the rate constant.
36. Be able to obtain the rate law from the experimental data.
37. Understand the collision theory and the transition state theory.
38. Be able to apply the Arrhenius equation to solve for the activation energy.
39. Be able to apply the integrated rate equations for zero-order, first-order, and the second-order.
40. Understand the relaxation methods (T-jump, P-jump, …) and their applications.
41. Explain how the reaction rates are measured for very fast reactions. Specifically, stopped-flow, continuous-flow, and flash photolysis.
42. Be familiar with terms such as molecularity and elementary reaction, and rate determining step.

43. Understand catalysis, distinguish between the homogeneous versus heterogeneous catalysis.
44. Understand the difference between an enzyme and a catalyst.
45. Understand the steady-state approximation and be able to use this method to obtain the rate law from a given mechanism.
46. Understand the atomic and molecular spectra show and their relation to quantization of energy.
47. Understand the photoelectric effect and the threshold frequency associated with the elements.
48. Understand the wave-like character of electrons and the wave-particle duality.
49. Understand the Schrödinger equation in one dimension.
50. Understand the boundary conditions and their implications on the energy and the wavefunction.
51. Understand the Born interpretation, the probability.
52. Understand the uncertainty principle.
53. Understand the zero-point energy.
54. Understand the degeneracy associated with a quantum state and its origin.
55. Understand the tunneling effect and be able to provide examples in practical terms.

LAS
Embedded Assessment Action Report

For

Program Review

Degree Program(s): __________BS Chemistry________________________________

(BA, BS, BFA, MA, MS, LACC, etc.)

Course # / Title: ___Ch221 General Chemistry, W 2012______________________

Faculty name: _____Pete Poston____

Date: _______________________________________

A) State the program **learning outcome** or **general education goal** this assessment is linked to:

The following items were used on the quizzes, midterms, and final exams (both lecture and lab) as the **LEARNING OUTCOMES** for this course.

be able to apply the scientific method
classification of matter
Metric System
Scientific calculations following significant figure conventions
Chemical Nomenclature
Atomic Theory
The Periodic Table
Molecules and Ions
molecular vs. empirical formulas
predicting formulas of ionic compounds
definition of atomic mass and molecular masses
The mole, molar mass, and Avogadro's number
Conversions between grams, moles, and atoms
Determining empirical formula from % composition
Combustion analysis
Stoichiometry calculations and limiting reagents
strong, weak, and non-electrolytes
Precipitation Reactions and Solubility Rules
Net Ionic Equations
Arrhenius versus Bronsted definition of acids/bases
Acid-Base Neutralization Reactions
Oxidation-Reduction (Redox) reactions and Oxidizing and Reducing agents
Half reactions
Molarity and the Dilution Equation
Stoichiometry problems using molarity

- # Titrations
- # Law of Conservation of Energy, Potential and Kinetic Energy
- # Units of heat energy
- # Thermochemistry - Exothermic versus endothermic reactions
- # Thermodynamics – state and state functions
- # Enthalpy
- # Stoichiometry calculations involving heat
- # Calorimetry – constant volume and constant pressure
- # Using $\Delta H^o_{rxn} = \Sigma\, n_p \times \Delta H_f^o(\text{products}) - \Sigma\, n_r \times \Delta H_f^o(\text{reactants})$
- # Hess' Law Calculations
- # Properties of waves: $u = \lambda\nu$ (memorize)
- # Electromagnetic radiation and the Electromagnetic Spectrum
- # Atomic Line Spectra
- # The Bohr Model of Hydrogen

B) Check the embedded assessment tool(s) used :

x Exam question
☐ Essay
☐ Oral presentation
☐ Thesis
☐ Portfolios
☐ Practicum / Service Learning
☐ Capstone paper / project
☐ Other ____

Attach a copy of the actual question / assignment as it is presented to the student or a description of the embedded process.

Copies of the midterms, final, or quizzes are available if needed.

The assessment form in this course was based upon a selected number of ***learning outcomes*** and students' performance on two midterms, eight quizzes, a lecture final exam, lab experiments (handouts), and a lab final.

- Students demonstrated competence on the learning outcomes by scoring 70% (considered a "C") or higher overall in the class. The course grade was based on the following lecture and lab components:

200 pts (36%) 2 hour exams
200 pts (36%) comprehensive final
100 pts (18%) 25 pts from lab final, 75 points from lab exercises (drop lowest score)
50 pts (9%) quizzes (drop the lowest and scale total to 50 pts)
550 pts total

- The average score on the first midterm was 74%
- The average score on the second midterm was 72%
- The overall quiz average was 75%
- The average score on the lecture final exam was 65%
- The average score in lab was 87%
- The average overall score in the class was 73%

LAS
Embedded Assessment Action Report

For

Program Review

Degree Program(s): __________BS Chemistry_______________________________

(BA, BS, BFA, MA, MS, LACC, etc.)

Course # / Title: ___Ch222 General Chemistry, S 2012____________________

Faculty name: _____Pete Poston_______________________________________

Date: ____________________________________

A) State the program **learning outcome** or **general education goal** this assessment is linked to:

The following items were used on the quizzes, midterms, and final exams (both lecture and lab) as the **LEARNING OUTCOMES** for this course.

- Quantum Mechanics – basic principles
- energy of orbitals in Hydrogen and multielectron atoms
- splitting of subshell energies in multielectron atoms due to greater penetration of s-electrons compared to p and d.
- energy level filling order diagram (memorize)
- the Pauli Exclusion Principle, the Aufbau Principle, and Hund's rule
- electron configurations through Z= 36 including Cr and Cu exception
- orbital box diagrams
- know where the s, p, d, and f-blocks are in the periodic table, and use them to determne electron configurations
- electron spin and cause of magnetism
- diamagnetism and paramagnetism
- Mendeleev and the Periodic Law
- Representative elements, Noble gases, Transition elements, f-block transition elements
- valence electrons – representative vs. transition metals
- electron configurations of cations and anions (transition metals s-electrons removed first)
- shielding and effective nuclear charge (nuclear charge effect)
- periodicity in atomic radius, ionic radius, ionization energy, and electron affinity
- Lewis dot symbols
- Lewis structures for ionic compounds
- Lattice energies, Coulomb's Law, and Born-Haber cycles
- Lewis structures for covalent compounds, single, double, and triple bonds

- Bond lengths
- properties of covalent vs. ionic compounds
- polar covalent compounds
- trends in electronegativity
- predicting polar covalent vs. ionic bonds
- Lewis structures for charges species
- formal charge
- guidelines for drawing Lewis structures including (1) selecting a central atom with the lowest electronegativity, (2) choosing a structure with the least formal charge on each atom, (3) choosing a structure where the lowest formal charge is on the most electronegative atom
- drawing resonance structures (hybrids)
- Exceptions to the Octet Rule: (1) less than 8 valence electrons for Group 3A, (2) expanded octets when the central atom is in the 3^{rd} period or higher (exccpt for charged polyatomic ions mentioned in the major exception above), (3) odd-electron species (free radicals)
- bond energies and calculation of ΔH^o_{rxn}
- VSEPR Geometry (A = central atom, B = terminal atom, E = lone pair)
- Applying VSEPR theory - (1) Lewis structure, (2) count electron clouds around central atom, (3) determine appropriate VSEPR electron cloud geometry first, (4) then determine molecular geometry based on the position of atoms in space
- Remember: Multiple bonds count as one cloud in VSEPR theory
- Molecular geometries of more complicated molecules with more than one central atom (apply VSEPR theory to each central atom)
- Dipole moments and polar molecules
- Valence Bond Theory – hybrid orbitals
- σ and π bonds
- Be able to illustrate hybridization for simple molecules using orbital diagrams, showing σ and π bonds
- Molecular Orbital Theory – bonding and antibonding orbitals, given MO energy diagrams (be able to fill in the MO's, determine stability based on bond order, predict magnetism, and identify as σ vs π-bonding
- Gas phase elements - H_2, N_2, F_2, O_2, Cl_2 and the Noble Gases
- Properties of gases – indefinite shape and volume, compressible, mix together evenly and completely, low densities (g/L)
- Pressure = force/area, units: atm, mmHg (Torr), Pa; converting between units
- Mercury barometer
- Simple Gas Laws:
- Avogadro's Law and Stoichiometery: equal volumes of any two gases contain the same number of moles
- Ideal Gas Law: PV = nRT
- Deriving simple gas laws from Ideal Gas Law
- STP: standard temperature and pressure = 1 atm and 273K; 1 mole of any gas occupies 22.4 L @ STP
- Situations where many variables change simultaneously: $P_1V_1/n_1T_1 = P_2V_2/n_2T_2$
- Calculating densities and molecular weights from the Ideal Gas Law: d = PM/RT, rearranging then M = dRT/P, if don't know density then M = gRT/PV
- Gas Stoichiometry Problems
- Dalton's Law of Partial Pressures
- Collecting a gas over water: $P_{total} = P_{gas} + P_{H2O}$
- Kinetic Molecular Theory: <KE> α T, molecular speeds as a function of temperature and molar mass
- intermolecular forces:
- Properties of liquids: surface tension, cohesion and adhesion, viscosity,
- Unique properties of water: 3-D hexagonal structure of ice (unusual because the solid is less dense than the liquid), maximum density at 4 ^oC (why?)
- Kinetic Molecular Theory of liquids

- Liquid-vapor equilibrium – evaporation and condensation, equilibrium vapor pressure, boiling point, ΔH_{vap}, trends in boiling point and ΔH_{vap} and dependence on intermolecular forces (Table 11.6)
- Clausius-Clapeyron equation (given)
- Vapor pressure vs. temperature curves and effect of intermolecular forces
- Liquid-solid equilibrium – melting and freezing point, ΔH_{fus}, trends in melting point and ΔH_{fus} and dependence on intermolecular forces
- Heating curves – qualitatively understand what happens as you heat a substance through phase boundaries
- Solid-vapor equilibrium – sublimation and deposition, $\Delta H_{sub} = \Delta H_{fus} + \Delta H_{vap}$
- Be able to use ΔH_{vap}, ΔH_{fus}, and ΔH_{sub} to calculate heat changes across phase boundaries
- Phase diagrams – boundaries, positive vs. negative slope for solid-liquid boundary, triple point, critical T and P, supercritical fluids
- saturated, unsaturated, supersaturated
- concentration units – mole fraction (χ), molarity (M), molality (*m*)
- Colligative Properties of Nonelectrolyte Solutions – vapor pressure lowering and Raoult's Law, boiling point elevation and freezing point elevation calculations
- Using colligative properties to determine molar mass
- Colligative Properties of Electrolyte Solutions – van't Hoff factor
- A molecular view of the solution process – miscible vs. immiscible, Like dissolves Like
- The effect of temperature on solubility – solubility of solids and fractional crystallization, gas solubilities
- The effect of pressure on the solubility of gases – Henry's Law
- factors controlling reaction kinetics
- definition of a rate and determining graphically by measuring slope
- average vs. instantaneous rate
- reaction rates and stoichiometry
- The Rate Law: rate = $k[A]^a[B]^b[C]^c$...
- Order of a reaction in terms of a given reactant and overall
- The Method of Initial Rates
- First Order kinetics

B) Check the embedded assessment tool(s) used :

x Exam question
☐ Essay
☐ Oral presentation
☐ Thesis
☐ Portfolios
☐ Practicum / Service Learning
☐ Capstone paper / project
☐ Other ____

Attach a copy of the actual question / assignment as it is presented to the student or a description of the embedded process.

Copies of the midterms, final, or quizzes are available if needed.

The assessment form in this course was based upon a selected number of ***learning outcomes*** and students' performance on two midterms, eight quizzes, a lecture final exam, lab experiments (handouts), and a lab final.

- Students demonstrated competence on the learning outcomes by scoring 70% (considered a "C") or higher overall in the class. The course grade was based on the following lecture and lab components:

200 pts (36%) 2 hour exams

200 pts (36%) comprehensive final

100 pts (18%) 25 pts from lab final, 75 points from lab exercises (drop lowest score)

50 pts (9%) quizzes (drop the lowest and scale total to 50 pts)

550 pts total

- The average score on the first midterm was 77%
- The average score on the second midterm was 77%
- The overall quiz average was 73%
- The average score on the lecture final exam was 69%
- The average score in the lab was 88%
- The average overall score in the class was 76%

LAS
Embedded Assessment Action Report

For

Program Review

Degree Program(s): __________BS Chemistry________________________________

(BA, BS, BFA, MA, MS, LACC, etc.)

Course # / Title: ___Ch312 Quantitative Methods, W 2012___________________

Faculty name: ______Pete Poston____

Date: ____

A) State the program **learning outcome** or **general education goal** this assessment is linked to:

The following items were used on the quizzes, midterms, and final exams (both lecture and lab) as the **LEARNING OUTCOMES** for this course.

- propagation of errors - addition/subtraction and mult/div formulas
- frequency distributions and histograms
- Normal Gaussian distributions
- confidence intervals, Student's t-distribution, and the confidence interval of the mean
- Q-testing data
- general titration setup, standard solutions, primary standards, indicators
- endpoint vs. equivalence point
- Equivalence point calculations, percent purity
- back titrations
- Ksp - the solubility product
- solubility calculations:
- The common ion effect
- Will a precipitate form ($Q > K_{sp}$)?
- Stoichiometry review, percent purity calculations, gravimetric factors

- organic precipitating agents
- Properties of precipitates, colloids
- relative supersaturation
- colloid growth and coagulation
- coprecipitation with colloids, digestion
- practical treatment of colloids
- ignition of precipitat
- Bronsted-Lowry theory, conjugate acids and bases
- self-ionization of water and K_w
- strengths of acids and bases - table of strong acids and bases
- classes of weak acids and bases
- hydrolysis reactions
- pH of solutions containing strong acids or bases (given formula if M acid or base very small)
- pH of solutions containing weak acids or bases - approximate, exact, and method of successive approximations
- Henderson-Hasselbach equation
- A buffer in action
- How to practically prepare a buffer solution
- The Effect of Ionic Strength on Solubility of Salts
- Ionic Atmospheres and Increased Solubility
- Activities and activity coefficients
- Charge Effect – equation for calculating ionic strength
- Extended Huckel-Debye equation (given)
- example activity coefficient calculations
- the real definition of pH
- Systematic Treatment of Equilibria: mass balance, charge balance
- indicators and titration errors
- strong acid-strong base titration curve – with either acid <u>or</u> base as analyte
- weak acid- strong base titration curve – with either acid <u>or</u> base as analyte
- amino acids - acidic form (H_2L^+), intermediate (zwitterion - HL), and basic forms (L^-)
- polyprotic acid titration curves - be able to <u>**generally**</u> graph the titration curve using first half eq. pt. = pK_{a1}, first eq. pt. = $(pK_{a1} + pK_{a2})/2$, etc.
- complex ions, EDTA, stepwise formation constants
- EDTA lab calcs: standardization, percent purity of unknown, water hardnessmasking problems
- pH dependence of EDTA titrations
- Fractional composition diagrams – know general shape for a given acid or base
- Buffers of polyprotic acids/bases
- effective equilibrium constant (Conditional Formation Constant)
- example of using the Conditional Formation Constant in an equilibrium calculation
- titration curves - be able to calculate pM **at the eq. pt.**
- indicators - Calgamite, addition of Mg to the EDTA to sharpen the Ca endpoint
- effect of formation constant and pH on shape of titration curve
- titrations of a mixture – which ion precipitates first
- titration curves of a mixture, be able to calculate concentration of ions in a mixture given the curve and eq. pt. volumes
- Mohr, Volhard, and Fajans methods (including indicators)
- galvanic (voltaic) cells
- standard reduction potentials
- Nernst equation, equilibrium constant formula
- reference electrodes Ag/AgCl and calomel
- converting between scales using different references
- potentiometric titrations - 2^{nd} derivative plots - be able to calculate eq. pt. numerically
- How ion-selective electrodes work – A. liquid-based, glass membrane (e.g.Ca^{2+} ion and pH), B. Solid State (e.g. F^-)
- potentials: 59.2 mV/n voltage change per factor of 10 change in concentration where n =

charge on ion
- detection limits and interferences
- sample treatment: tin(II) chloride, $HgCl_2$, Zimmerman-Reinhard reagent
- Fe ore titration calculations – standardization and percent purity
- Theory of redox titration curves – half eq. pt. and endpoint potentials versus the Saturated Calomel Electrode calculation, formal potentials, choice of indicator
- properties of light, $c = \lambda\nu$, $E = h\nu$
- electromagnetic spectrum (know qualitatively) and know what kind of excitation process is occurring: e.g UV-Vis = electronic excitation, IR = vibration etc
- ground states vs excited states, calculating photon energies
- radiant power, Po and P, transmittance and absorbance
- Beer's Law and finding concentration from absorbance
- using Beer's Law – preparing and using calibration curves
- Beer's Law of a Mixture – know how it was applied in the UV-Vis lab
- What Is Atomic Spectroscopy? – know basic instrumental configuration
- flame atomization – aspiration, nebulization, etc
- complete atomization and detection limits
- fuels and flame temperatures as pertains to previous bullet
- What is chromatography?
- mobile phase, stationary phase, elution
- different types of chromatography – adsorption, partition, ion-exchange, molecular exclusion, affinity
- the chromatogram
- internal standard calculations
- basic description of process (stationary phase, mobile phase, match sample polarity to stationary phase, separate by boiling points, etc)
- basic instrumentation
- injection port basics
- capillary columns – we use WCOT
- stationary phases and their effect on separation – be able to draw structure of a polysiloxane
- temperature programming

B) Check the embedded assessment tool(s) used :

x Exam question
☐ Essay
☐ Oral presentation
☐ Thesis
☐ Portfolios
☐ Practicum / Service Learning
☐ Capstone paper / project
☐ Other ____

Attach a copy of the actual question / assignment as it is presented to the student or a description of the embedded process.

Copies of the midterms, final, or quizzes are available if needed.

The assessment form in this course was based upon a selected number of ***learning outcomes*** and students' performance on two midterms, nine labs, a lab notebook, and a final exam.

- Students demonstrated competence on the learning outcomes by scoring 70% (considered a "C") or higher overall in the class. The course grade was based on the following lecture and lab components:

2 midterms	200	points (35 %)
Final - weighted towards final chapters	200	points (35 %)
Lab: first 6 labs at 20 pts; last 3 labs at 10 pts	150	points (26 %)
Lab notebook	25	points (4 %)
Total	575	points

- The average score on the first midterm was 71%
- The average score on the second midterm was 74%
- The average score on the lecture final exam was 66%
- The average score in the lab was 75%
- The average overall score in the class was 68%

LAS
Embedded Assessment Action Report

For

Program Review

Degree Program(s): __________BS Chemistry________________________________

(BA, BS, BFA, MA, MS, LACC, etc.)

Course # / Title: ___Ch313 Instrumental Methods, S 2012___________________

Faculty name: _____Pete Poston____

Date: _______________________________________

A) State the program **learning outcome** or **general education goal** this assessment is linked to:

The following items were used on the quizzes, midterms, and final exams (both lecture and lab) as the **LEARNING OUTCOMES** for this course.

- Basic statistics review
- Calibration Curves - sensitivity, detection limits (LOD)
- EM radiation – wavelength, frequency, photons
- EM spectrum (know qualitatively) - calculations of □ and □
- Superposition of waves – constructive and destructive interference
- Fraunhofer Diffraction – order, intensity, widths of color bands, blue diffracted <u>smaller</u> angle than red
- Refraction of Light - refractive index, dispersion, unequal widths of color bands, blue refracted <u>larger</u> angle than red
- Interactions of Radiation and Matter – absorption, emission, luminescence, scattering
- Atomic vs. Molecular transitions
- Spectroscopy, Optical Instruments, Optical Spectroscopic Methods
- % basic elements of optical instruments
- Sources of Radiation
- Optical materials – visible, UV, IR

- Filters – FWHM, bandwidth
- Grating monochromator design and components
- Echellette grating and the grating equation, holographic gratins
- Reciprocal Linear Dispersion
- Resolving Power of Monochromators
- Light Gathering Power of Monochromators
- Effect of slit width on resolution
- Resolution
- Radiation Transducers - vacuum phototube, photomultiplier tube, photodiodes, photodiode arrays, CCD’s, spectral response
- Transmittance and absorbance
- Beer's Law – wavelength dependence of molar absorptivity
- Absorbance spectrum – molar absorptivity is wavelength dependent
- Limitations to Beer’s Law - concentration effect, chemical deviations (equilibrium), polychromatic radiation, stray light
- Light sources – UV and Vis, blackbody radiation and continuum sources
- Single vs. Double Beam Instruments – how double beam instruments remove the background
- Double Dispersing Instruments - How stray light controls the LOD
- Multichannel Instruments
- Absorption by Organic Molecules - types of electronic transitions, e.g. $\square \rightarrow \square^{*}$, allowed vs. forbidden transitions
- General Absorbance Spectrum
- Spectral details are lost in the liquid phase - fine structure from vibrational sublevels
- Qualitative Analysis - Solvent shifts, effect of ring substituents on aromatic rings, effect of pH (indicators)
- Quantitative Analysis - mixtures, sample matrix and standard addition methods, derivative spectroscopy, enzyme kinetics
- Fluorescence, Phosphorescence and Nonradiative Decay - Singlet vs. triplet states, Jablonski Diagrams
- Quantum Yields
- Vibrational relaxation, internal conversion, intersystem crossing
- Luminescence lifetimes
- Fluorescence and structure
- Illustration of the Heavy Atom Effect
- Emission and excitation spectra
- Instruments for Measuring Fluorescence and Phosphorescence
- Xe-arc lamps
- Spectrofluorometers - corrected spectra
- Phosphorimeters
- Selectivity
- Effect of Concentration on Fluorescence Intensity
- Absorbance vs. Fluorescence Signals
- Comparing UV-Vis to Fluorescence LOD's
- Applications – Inorganic, Organic, Forensics, Imaging
- atomic spectra - emission, absorption, fluorescence
- line broadening
- flame atomization - common fuel mixtures
- flame populations
- flame structure and T profile
- sample positioning and flow rates
- atomization and nebulization
- burners
- electrothermal atomization - graphite furnace
- Atomic Absorption Spectroscopy - hollow cathode lamps
- interferences - releasing & protecting agents, ionization in flames

- LOD's as a function of atomization method
- Inductively Coupled Plasma (ICP) Spectroscopy
- Emission of X-Rays – Electron Beam Source
- Continuum and Line Sources
- Line Spectra (K, L, M...)
- Origin of X-Ray Line Spectra
- Radioactive Sources
- X-Ray Fluorescence
- Diffraction and Bragg's Law
- Photon Counting
- Wavelength Dispersive versus Energy Dispersive Instruments
- Theory - wavenumbers
- vibrational frequency
- absorption process and selection rules
- types of vibrations (normal modes)
- calculating wavenumber of a peak
- frequency-mass and force constant-bond strength correlations
- Definition of the Fourier Transform – know what it does qualitatively
- FTIR
- Applications of IR
- Qualitative IR - peak identification from a correlation chart
- Quantitative IR - reasons why IR less sensitive and why FTIR has improved sensitivity
- Diffuse Reflectance
- ATR Spectrometry
- IR Microscopy
- Rayleigh scattering (from Ch 6 – section 6B-10)
- Raman Scattering – Stokes and anti-Stokes
- Excitation and Mechanism of Raman Spectra
- Comparison of Raman & IR Spectra
- Instrumentation
- Process Analytical Chemistry
- Theory of NMR – nuclear spin states, spin quantum number (I), number of spin states 2I+1, energy levels in an external magnetic field, ΔE and absorption of radiofrequency radiation
- Classical Description of NMR – precession, circularly polarized radiation, Larmor Frequency
- FT-NMR – pulsed excitation, free induction decay (FID)
- Origin of the Chemical Shift, Shielding
- General Correlation Chart
- Theory of the Chemical Shift – electronegativity, hybridization, acidic protons, magnetic anisotropy
- 1^{st} Order Interpretation of NMR Spectra – spin-spin splitting (N+1 rule), simple interpretation of an NMR spectrum, signal integration
- FT-NMR Spectrometers
- Resolution of FT-NMR Spectrometers
- Carbon-13 NMR
- outline of technique (sample → fragments etc), ion sources
- hard vs. soft ionization
- electron impact (EI) ionization
- electron impact ion source
- McLafferty rearrangement
- example electron impact spectra – alkanes and aromatics
- chemical ionization (CI) – methane as reagent gas
- electrospray ionization and spectra
- Instrumentation outline
- Mass analyzers - magnetic sector, quadrupole, time of flight
- electron multiplier detector
- General Description of Chromatography

- Classification of Chromatographic Methods
- Elution in Column Chromatography
- Plate Theory – band broadening, experimental evaluation of H and N from the chromatogram
- Rate Theory - longitudinal diffusion, stationary phase-mass transfer term, eddy diffusion, Van Deemter equation, optimal flow rate
- Practical Control of Separation
- Resolution
- Retention (Capacity) Factor – optimal value
- Selectivity Factor
- Resolution, capacity factor, and selectivity combined expression
- basic description of process (stationary phase, mobile phase, match sample polarity to stationary phase, separate by boiling points, etc)
- Basic Instrumentation
- injection port – know split vs. splitless
- packed columns, solid support, bonded phases, liquid-coated stationary phases
- capillary columns – we use WCOT
- common stationary phases in capillary GC – be able to draw structure of a polysiloxane, know cross-linking and column bleed (max column temperature)
- Effect of particle size on the Eddy Diffusion term
- temperature programming
- detectors – thermal conductivity, FID, ECD
- Gas Chromatography-Mass Spectrometry – TIC vs. SIC
- example separations
- HPLC, scope of LC, partition chromatography
- LC van Deemter plots – understand effect of particle size and lack of B-term
- Instrumentation
- normal vs. reversed phase separations
- mobile phase

B) Check the embedded assessment tool(s) used :

x Exam question
☐ Essay
☐ Oral presentation
☐ Thesis
☐ Portfolios
☐ Practicum / Service Learning
☐ Capstone paper / project
☐ Other ____

Attach a copy of the actual question / assignment as it is presented to the student or a description of the embedded process.

Copies of the midterms, final, or quizzes are available if needed.

The assessment form in this course was based upon a selected number of ***learning outcomes*** and students' performance on two midterms, an informal writing component, lab handouts, a formal writing component (lab reports), and a comprehensive final exam.

- Students demonstrated competence on the learning outcomes by scoring 70% (considered a "C") or higher overall in the class. The course grade was based on the following lecture and lab components:

200 pts	(36%) two 100 pt hour exams
200 pts	(36%) 200 pt comprehensive final
50 pts	(9%) 8 quizzes @ 10 pts each - score scaled to 50 pts total
100 pts	(18%) labs and written reports (100 pts), writing exercise (10 pts), total scaled to 100 pts.
550 pts	total

- The average score on the first midterm was 77%
- The average score on the second midterm was 76%
- The average score on the quizzes was 73%
- The average score on the lecture final exam was 66%
- The average score in the lab was 89%
- The average overall score in the class was 75%

LAS
Embedded Assessment Action Report

For

Program Review

Degree Program(s): __________BS Chemistry________________________________

(BA, BS, BFA, MA, MS, LACC, etc.)

Course # / Title: ___Ch161 Forensic Photography, F 2011____________________

Faculty name: _____Pete Poston____

Date: ____

A) State the program **learning outcome** or **general education goal** this assessment is linked to:

The following items were used on the quizzes, midterms, and final exams (both lecture and lab) as the **LEARNING OUTCOMES** for this course.

- Identify the various parts and controls of a digital or 35mm SLR film camera.
- Understand the basic principles of how to operate a digital 35mm SLR film camera.
- Understand the factors that control exposure.
- Understand how to hold the camera
- Identify basic camera controls.
- Understand the relationship between the shutter and light.
- Understand how to convey motion in a still photograph.
- Understand how the aperture of the camera works in relation to light.
- Understand the concept of depth of field and how to control it.
- Understand how to use shutter speed and aperture to control exposure.

- Know what a lens is and how it works.
- Understand the differences between lenses of different focal lengths.
- Identify special purpose lenses.
- Understand the relationship between focus and depth of field.
- Understand the relationship between focal length and perspective.
- Work effectively in close-up situations.

- What is light?
- Infrared photography in forensics.
- Sensors, pixels and resolution
- How color is rendered in digital photography
- Setting the white balance
- Using histograms
- Understanding the types of exposure meters and metering techniques.
- Making an exposure of an 18% gray scene
- Exposing for scenes that are lighter or darker than 18% gray
- Backlighting, high contrast scenes, and High Dynamic Range (HDR)

- Learn about different file formats
- Understand bit depth and resolution
- Digital color and gamuts
- Using channels
- Understand monitor calibration
- CCD construction and how it produces a color imagecolor

- Learning how to use Photoshop
- In lab we will use Adobe Camera RAW (ACR)
- Adjust portions or complete images using software tools such as resizing, grayscaling, using channels, adjusting color, levels, curves and histograms.
- Use other techniques including filters to readjust or sharpen images.

- Understand the basic concepts of degree of diffusion and direction of light.
- Shoot effectively with available light.
- Identify a variety of lighting equipment including lights, diffusers and reflectors, supports for lighting devices, and understand their uses.
- Meter for flash and calculate exposure.

- Understand how to do crime scene photography
- Understand HDR photography
- Understand photostiching

B) Check the embedded assessment tool(s) used :

x Exam question
☐ Essay
☐ Oral presentation
☐ Thesis
☐ Portfolios
☐ Practicum / Service Learning
☐ Capstone paper / project
☐ Other ____

Attach a copy of the actual question / assignment as it is presented to the student or a description of the embedded process.

Copies of the midterms, final, or quizzes are available if needed.

The assessment form in this course was based upon a selected number of ***learning outcomes*** and students' performance on two midterms, eight quizzes, a lecture final exam, lab experiments (handouts), and a lab final.

- Students demonstrated competence on the learning outcomes by scoring 70% (considered a "C") or higher overall in the class. The course grade was based on the following lecture and lab components:

140 pts (35%) comprehensive final
160 pts (45%) lab - 8 labs @ 20 pts each
50 pts (12.5%) Special project
50 pts (12.5%) quizzes
400 pts tota

- The average score on the final was 81%
- The average score in the lab was 93%
- The average score on the quizzes was 92%
- The average score on the special project was 100%

LAS
Embedded Assessment Action Report

For

Program Review

Degree Program(s): ___________BS Chemistry__________________________________

(BA, BS, BFA, MA, MS, LACC, etc.)

Course # / Title: ___Ch354 Computational Chemistry, W 2012_______________

Faculty name: _____Pete Poston____

Date: ______________________________________

A) State the program **learning outcome** or **general education goal** this assessment is linked to:

Students use the mathematical program called Matlab to write programs for commonly used mathematical calculations in Chemistry. The labs are:

- Quadratic Formula
- Equilibrium
- Titration Curves
- Linear Least Squares
- Numerical Integration
- Linear Algebra and Matrices
- Chemometrics - Linear Modelling
- Fourier Transforms
- Hybrid Orbitals
- Molcecular Modelling Using Spartan
- Special Project

B) Check the embedded assessment tool(s) used :

☐Exam question
☐ Essay
☐ Oral presentation
☐ Thesis
x Portfolios
☐ Practicum / Service Learning
x Capstone paper / project
☐ Other ____

Attach a copy of the actual question / assignment as it is presented to the student or a description of the embedded process.

Copies of labs are available if needed.

The assessment form in this course was based upon a selected number of ***learning outcomes*** and students' performance on two midterms, eight quizzes, a lecture final exam, lab experiments (handouts), and a lab final.

- Students demonstrated competence on the learning outcomes by scoring 70% (considered a "C") or higher overall in the class. The course grade was based on the following lecture and lab components:

200 pts (80%) 10 labs @ 20 pts each
50 pts (20%) Special Project
250 pts total

- The average score on the lab was 100%
- The average score on the special project was 100%