Instructor: Dr. Amy Toole  
Email: amy.toole@utoledo.edu  
Office Hours: M 11:30-1:30; T 3:00-4:00; W 11:30-1:30 & 4:00-5:00 Also by appointment. I like visitors!  
Office Location: BO2086G  
Office Phone: 419-530-1503  
Term: Fall 2018

Section Day/Time/Location:

<table>
<thead>
<tr>
<th>Section</th>
<th>Day</th>
<th>Time</th>
<th>Location</th>
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<tbody>
<tr>
<td>001</td>
<td>Thursdays</td>
<td>8-9:50am</td>
<td>UH 4520</td>
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<tr>
<td>002</td>
<td>Thursdays</td>
<td>8-9:50am</td>
<td>UH 4500</td>
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<tr>
<td>003</td>
<td>Thursdays</td>
<td>10-11:50am</td>
<td>UH 4520</td>
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<td>004</td>
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<td>11:30-1:20pm</td>
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<td>005</td>
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<td>2:30-4:20pm</td>
<td>BO 2045</td>
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<td>006</td>
<td>Thursdays</td>
<td>5:45-7:35pm</td>
<td>FH 1350</td>
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<tr>
<td>007</td>
<td>Fridays</td>
<td>10-11:50am</td>
<td>BO 2059</td>
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<tr>
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<td>FH 2680</td>
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<tr>
<td>009</td>
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<tr>
<td>010</td>
<td>Fridays</td>
<td>10-11:50am</td>
<td>FH 1100</td>
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<tr>
<td>011</td>
<td>Thursdays</td>
<td>10-11:50am</td>
<td>UH 4500</td>
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<tr>
<td>012</td>
<td>Thursdays</td>
<td>2:30-4:20pm</td>
<td>BO 2047</td>
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<td>013</td>
<td>Thursdays</td>
<td>5:45-7:35pm</td>
<td>BO 2047</td>
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<tr>
<td>014</td>
<td>Thursdays</td>
<td>5:30-7:20pm</td>
<td>FH 2840</td>
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<tr>
<td>015</td>
<td>Thursdays</td>
<td>10-11:50am</td>
<td>UH 4540</td>
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Credit Hours:  
1

Required Materials:  
- Calculator -- preferably the same non-programmable calculator you will use on exams in CHEM1230.

Congratulations! Taking this class was a great decision.
COURSE/CATALOG DESCRIPTION
Problem solving and skill development for students enrolled in CHEM 1230 who obtained a satisfactory score on the chemistry placement test, but need additional assistance in selected topics. May be taken only as P/NC (Pass/No Credit).

PURPOSE
This course is designed to supplement CHEM 1230, General Chemistry I. It is hoped that your experiences in this course will help you improve your understanding of chemistry and develop study habits valuable in many courses.

General Chemistry instructors think that this class is worthwhile for 3 reasons:

1) 75% of previous students said at the end of the course that they would suggest or recommend it to their friends. That sounds like very strong evidence for what the course can do for you.

2) At the start and the end of the course students were asked to indicate their level of mastery on several topics from CHEM 1230. Those who take CHEM 1200 express a significantly greater improvement in this measure compared to those who do not take CHEM 1200 with 1230.

3) We have done a statistical analysis of the grades in CHEM 1230. For students with comparable backgrounds, like placement and ACT scores, taking CHEM 1200 with 1230 makes an average difference of one-third of a letter grade, that is, from a C to a C+ or from a C+ to a B-. The course gives you an EDGE!

Students like most aspects of the course, but they do ask questions about two aspects:

1) The scheduled sessions of 1 hour 50 minutes seems long to some, especially given the short class times found in most high schools. However, we think that this is an ideal amount of time for a low-key study session like CHEM 1200. Remember, this is not lecture or recitation, but a working session similar to doing your homework. If you plan to be successful in science or engineering in college you will surely need to be able to work on a subject for this amount of time. Some sessions are completed earlier – none go later. Typically expect a 90 minute session – but Weeks 2 and 3 will require the full 1 hour 50 minutes in order to review material before the first exam in Week 4.

2) CHEM 1200 is generally right on track with the CHEM 1230 lecture, but occasionally a bit ahead. This cannot be avoided for a once a week class – and should not be a problem since we don’t have exams or letter grades in CHEM 1200. If the topic is relatively new to you when you arrive at the CHEM 1200 the session, the group work should be very useful.

COURSE FORMAT
This course will be taught using the Peer-Led Team Learning technique. That is, each week you will spend an average of 90 minutes completing exercises in cooperation with other students and guided by a student who has recently completed General Chemistry and has received training as a peer-leader. Most peer-leaders earned As in CHEM1230; many also took CHEM1200.

Here is what you should expect to do most weeks.

1. Watch a brief (10-15 min), narrated slide presentation before 8 AM Thursday. Presentations are accessed through Blackboard and will give key information related to the work you will do before meeting with your peer-leader.

2. Read several pages in the workbook for the course (Peer-Led Team Learning: General Chemistry, Gosser, Strozak, Cracolice, 2006) and complete one or more “self-test” questions.

3. Attend a class/session with your peer-leader.

There are no exams in this course, but some weeks, in preparation for each of the three-hour exams and the final exam in your CHEM1230 course, there will be online quizzes to complete. You will complete the quizzes using your notes, text or any other resources you wish (except another person). When you have a quiz to complete there is often no other assignment or class meeting.
GRADING
The majority of points in CHEM1200 are earned through attendance and participation. If you miss a session with your peer-leader for a reason consistent with the University’s Missed Class Policy you should immediately contact the instructor to request an excused absence. The goal should be not to miss any classes since each one should help you.

Course Points: The following is the distribution of possible points in the course.

<table>
<thead>
<tr>
<th>Course Aspect</th>
<th>Points</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Watching Slide Presentations (1-2 pts each)</td>
<td>12</td>
<td>12%</td>
</tr>
<tr>
<td>Weekly Sessions</td>
<td></td>
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</tr>
<tr>
<td>Bring completed self-test from workbook (2 pts each)</td>
<td>60</td>
<td>60%</td>
</tr>
<tr>
<td>Attendance (2 pts each)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participation in problem solving (2 pts each)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Online Quizzes (5 pts each)</td>
<td>20</td>
<td>20%</td>
</tr>
<tr>
<td>Pre- and Post-Course Surveys (4 pts each)</td>
<td>8</td>
<td>8%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>100</strong></td>
<td><strong>100%</strong></td>
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</table>

Letter Grades: This course is graded on the Pass/No Credit grading system. If you earn 70 points you will receive a grade of Pass (P). If you earn less than 70 points you will receive a grade of No Credit (NC).

ADD/DROP DEADLINES
Dropped courses do not appear on your transcript. The deadline for dropping is **Monday, September 10th**. You may withdraw from the course and receive a grade of W. The deadline for withdrawal is **Friday, November 2nd**. W’s do not affect your GPA. Course registration changes might affect your financial aid. During the term, instructors report student attendance: these reports can also affect your financial aid, so you will want to be sure that you are in attendance for all classes. You will remain enrolled in the class unless you take the action of dropping or withdrawing. A course grade of Incomplete is given only to those who have completed all but a small percentage of course requirements for an acceptable reason. Participation in this course is contingent upon enrollment in CHEM 1230, so if you drop or withdraw from that class you are to do the same for this class.

TECHNOLOGY REQUIREMENTS
Students need to have access to a properly functioning computer throughout the semester in order to access announcements and slide presentations on Blackboard. Student computers need to be capable of running the latest versions of plug-ins, recent software and have the necessary tools to be kept free of viruses and spyware. Updated software is available from the Online Learning Download Center. You will need to use a calculator in the weekly sessions.

UNIVERSITY POLICIES
Policy Statement on Non-Discrimination on the basis of Disability (ADA):
The University is an equal opportunity educational institution. Please read The University’s Policy Statement on Nondiscrimination on the Basis of Disability Americans with Disability Act Compliance.

ACADEMIC ACCOMMODATIONS
The University of Toledo is committed to providing equal access to education for all students. If you have a documented disability or you believe you have a disability and would like information regarding academic accommodations/adjustments in this course please contact the Student Disability Services Office.

COMMUNICATION GUIDELINES
As your instructor, I am here to help, and will do my best to respond to email within 24 to 48 hours. Students are expected to check their UT email account and Blackboard frequently for important course information.

STUDENT SUPPORT SERVICES
Course scheduling assistance: Chemistry Department Secretary, Ms. Samples, is in Room BO 2022, telephone 419-530-2698. She takes care of all scheduling changes.
Chemistry Help Center: Located in room BO 2043, the Center is generally open all day Monday through Friday & evenings Monday through Thursday. TAs are available here: a schedule of their hours will be posted early in the term. No appointment is necessary and all TAs can help with General Chemistry.

UT Tutoring: Tutoring is available for a variety of subjects through the Learning Enhancement Center located in the Carlson Library.
This schedule is based on the topic order and exam schedule for CHEM 1230 rather than the presentation order of the textbook (workbook) for CHEM1200.

<table>
<thead>
<tr>
<th>Week</th>
<th>Date of Class</th>
<th>Before Class*</th>
<th>During Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Aug 30 or 31</td>
<td>Watch Intro Presentation Complete Pre-Course Survey by Sunday Midnight 9/2</td>
<td>There is no in-person session this week. Everything is online: do NOT go to the classroom.</td>
</tr>
<tr>
<td>2</td>
<td>Sept 6 or 7</td>
<td>Watch Week 2 Presentation Unit 1: Self Test 4 Unit 3: Self Tests 1 &amp; 2</td>
<td>Unit 3 Intro. to Stoichiometry: All Parts Unit 4 Strategies for Stoichiometry: Self-Tests 1 &amp; 2 (as time allows)</td>
</tr>
<tr>
<td>3</td>
<td>Sept 13 or 14</td>
<td>Watch Week 3 Presentation Unit 5: Self-Tests 1, 2 &amp; 3</td>
<td>Unit 4 Strategies for Stoichiometry: Workshop Questions 1-4 Unit 5 Ions in Solution: Workshop Questions 1-3, 5-7</td>
</tr>
<tr>
<td>4</td>
<td>Sept 20 or 21</td>
<td>To prepare for Exam 1, complete Quiz 1 by Tuesday Midnight</td>
<td>NO CLASS - remember to complete Quiz 1 by Tuesday Midnight</td>
</tr>
<tr>
<td>5</td>
<td>Sept 27 or 28</td>
<td>Watch Week 5 Presentation Unit 12-Oxidation/Reduction: Self-Tests 1 &amp; 2</td>
<td>Unit 12 Oxidation-Reduction: Workshop Questions 1, 2, 4, 5, 7, 8, 9</td>
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<tr>
<td>6</td>
<td>Oct 4 or 5</td>
<td>Watch Week 6 Presentation Unit 8-Energy &amp; the Hydrogen Atom: Self-Tests 1 &amp; 2 Unit 9-Building Atoms with Quantum Leaps: ST’s 1 &amp; 2</td>
<td>Unit 8 Energy and the Hydrogen Atom: Workshop Questions 1, 3c (use equation in Chemistry by McMurray et al.), 4, 6 Unit 9 Building Atoms with Quantum Leaps: 1,2,3,4,5</td>
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<tr>
<td>7</td>
<td>Oct 11 or 12</td>
<td>FALL BREAK NO CLASS</td>
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<tr>
<td>8</td>
<td>Oct 18 or 19</td>
<td>Watch Week 8 Presentation Unit 10 Covalent Bonding Self-Test 1</td>
<td>Unit 10 Covalent Bonding: Self-Test 2, Workshop Question 1 (only) – all parts</td>
</tr>
<tr>
<td>9</td>
<td>Oct 25 or 26</td>
<td>To prepare for Exam 2, complete Quiz 2 by Tuesday Midnight</td>
<td>NO CLASS – remember to complete Quiz 2 by Tuesday Midnight</td>
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<tr>
<td>10</td>
<td>Nov 1 or 2</td>
<td>Watch Week 10 Presentation Unit 11 Structure of Molecules: Self-Test 1</td>
<td>Unit 11 Structure of Molecules: Workshop Questions 1-3, 4(a-c only), 8 (a-c only), 9</td>
</tr>
<tr>
<td>11</td>
<td>Nov 8 or 9</td>
<td>Watch Week 11 Presentation Unit 7 Thermochemistry: Self-Test 1</td>
<td>Unit 7 Thermochemistry: Self-Test 4, Workshop Questions 1-4, 6, supplemented with EOC questions from the CHEM1230 text.</td>
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<tr>
<td>12</td>
<td>Nov 15 or 16</td>
<td>Watch Week 12 Presentation Unit 6 Gases: Self-Test 1</td>
<td>Unit 6 Gases: Self-Test 2, Workshop Questions 1, 3-4 supplemented with EOC questions from the CHEM1230 text.</td>
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<tr>
<td></td>
<td>Nov 22 or 23</td>
<td>THANKSGIVING NO CLASSES</td>
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</tr>
<tr>
<td>13</td>
<td>Nov 29 or 30</td>
<td>Watch Review Presentation To prepare for Exam 3, complete Quiz 3 by Tuesday Midnight</td>
<td>Begin to Review for Final using material from the CHEM1230 text. Bring textbook &amp; calculator.</td>
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<tr>
<td>14</td>
<td>Dec 6 or 7</td>
<td>To prepare for the Final Exam, complete Quiz 4 by Sunday Midnight</td>
<td>Continue to Review for Final using material from the CHEM1230 text. Bring textbook &amp; calculator.</td>
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<tr>
<td>Final Exams</td>
<td>No CLASS - Complete Post-Course Survey by Saturday 12/15 Midnight</td>
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*Each week the deadline for watching the narrated slide Presentation is Thursday 8AM
STUDENT LEARNING OBJECTIVES

From the Textbook: Chemistry, McMurry, Fay, Robinson 7e

Chapter 1 Chemical Tools: Experimentation and Measurement
1.2 Differentiate between a qualitative and quantitative measurement.
1.3 Write numbers in scientific notation and use prefixes for multiples of SI units.
1.5&6 Convert between different prefixes used in mass & length measurements
1.7 Convert between common units of temperature measurements.
1.9 Convert between different prefixes used in volume measurements.
1.10 Calculate mass, volume, or density using the formula for density.
1.11 Predict whether a substance will float or sink in another substance based on density.
1.12 Calculate kinetic energy of a moving object.
1.13 Convert between common energy units.
1.16 Report a measurement to the appropriate number of significant figures.
1.17 Report the answer of mathematical calculations to the correct number of significant figures.
1.19 Change a measurement into different units using appropriate conversion factors.

Chapter 2 Atoms, Molecules, and Ions
2.1 Use symbols to represent element names.
2.2 Identify the location of metals, nonmetals, and semimetals on the periodic table.
2.3 Indicate the atomic number, group number, and period number for an element whose position in the periodic table is given.
2.4 Identify groups as main group, transition metal group, or inner transition metal group.
2.7 Determine the mass of the products of a reaction using the law of mass conservation.
2.12 Describe the structure and size of the atom (Figure 2.6).
2.13 Calculate the number of atoms in a sample given the size of the atom.
2.14&15 Determine the mass number, atomic number, and number of protons neutrons and electrons from an isotope symbol & write isotope symbols for elements.
2.16 Calculate atomic weight given the fractional abundance and mass of each isotope.
2.17 Convert between grams and numbers of moles or atoms using the molar mass and Avogadro’s number.
2.18 Identify an element given the mass and number of atoms or moles.
2.19 Classify molecular representations of matter as a mixture, pure substance, element, or compound.
2.20 Convert between structural formulas, ball-and-stick models, and chemical formulas.
2.21 Classify bonds as ionic or covalent.
2.22 Determine the number of electrons and protons from chemical symbol and charge.
2.23 Match the molecular representation of an ionic compound with its chemical formula.
2.24&25 Convert between name and formula for ionic compounds.
2.26 Convert between name and formula for binary molecular compounds.

Chapter 3 Mass Relationships in Chemical Reactions
3.1 Visualize bonds broken and formed in a chemical reaction and relate numbers of molecules or atoms to the balanced reaction
3.2 Balance a chemical reaction given the formulas of reactants and products.
3.3 Calculate formula weight, molecular weight, and molar mass given a chemical formula or structure.
3.4 Interconvert between mass, moles, and molecules/atoms of a substance.
3.5 Relate the amount (moles or mass) of reactants and products in a balanced equation using stoichiometry.
3.6 Calculate percent yield given amounts of reactants and products.
3.7 Visualize the relative amounts of atoms or molecules in the reactants and products of a balanced reaction
3.8 Determine which reactant is limiting and calculate the theoretical yield of the product and the amount of excess reactant.
3.9 Calculate percent yield when one reactant is limiting.
3.10 Calculate the percent composition given a chemical formula or structure.
3.11 Determine the empirical and molecular formula given the mass percent composition and molecular weight of a compound.
3.12 Determine the empirical and molecular formula given combustion analysis data and molecular weight.
3.13 Determine the molecular weight of a substance given a mass spectrum. Determine empirical and molecular formula using both mass spectral and combustion analysis data
3.14 Identify a compound using molecular weight measured with a high mass accuracy mass spectrometer.

Chapter 4 Reactions In Aqueous Solution
4.1 Calculate the molarity of a solution given the mass of solute and total volume.
4.2 Calculate the amount of solute in a given volume of a solution with a known molarity.
4.3 Describe the proper technique for preparing solutions of known molarity.
4.4 Calculate the concentration of a solution after dilution.
4.5 Describe the proper technique for diluting solutions.
4.6 Classify a substance as a strong, weak, or nonelectrolyte.
4.7 Calculate the concentration of ions in a strong electrolyte solution.
4.8 Classify a reaction as a precipitation, acid–base neutralization, or oxidation–reduction (redox) reaction.
4.9 Write an ionic and net ionic equation and identify spectator ions given the molecular equation.
4.10 Use the solubility guidelines in Table 4.2 to predict the solubility of an ionic compound in water.
4.11 Predict whether a precipitation reaction will occur and write the ionic and net ionic equations.
4.12 Convert between name and formula for an acid.
4.13 Classify acids as strong or weak based on the molecular picture of dissociation.
4.14 Write the ionic equation and net ionic equation for an acid-base neutralization reaction.
4.15 Convert between moles and volume using molarity in stoichiometry calculations.
4.16 Determine the concentration of a solution using titration data.
4.17 Visualize the substances present in solution during a titration procedure.
4.18 Assign oxidation numbers to atoms in a compound.
4.19 Identify redox reactions, oxidizing agents, and reducing agents.
4.20 Use the location of elements in the periodic table & activity series to predict if a redox reaction will occur.
4.22 Use a redox titration to determine the concentration of an oxidizing or reducing agent in solution.

Chapter 5 Periodicity and Electronic Structure of the Atom
5.1 Label the wavelength, frequency and amplitude in an electromagnetic wave and understand their meaning.
5.2 Interconvert between wavelength and frequency of electromagnetic radiation.
5.3 Calculate the energy of electromagnetic radiation in units of J/photon or kJ/mol, when given the frequency or wavelength.
5.4 Describe the photoelectric effect and explain how it supports the theory of particlelike properties of light.
5.5 Calculate the frequency or wavelength of radiation needed to produce the photoelectric effect given the work function of a metal.
5.6 Compare the wavelength and frequency of different electron transitions in the Bohr model of the atom.
5.7 Relate wavelengths calculated using the Balmer-Rydberg equation to energy levels in the Bohr model of the atom.
5.8 Calculate the wavelength of a moving object using the de Broglie equation.
5.9 Explain why the wavelength of macroscopic objects is not observed.
5.10 Calculate the uncertainty in the position of moving object if the velocity is known.
5.11 Identify and write valid sets of quantum numbers that describe electrons in different types of orbitals.
5.12 Identify an orbital based on its shape and describe it using a set of quantum numbers.
5.13 Visualize the nodal planes in different types of orbitals and different shells.
5.14 Assign a set four quantum numbers for electrons in an atom.
5.15 Explain how electron shielding gives the order of subshells from lowest to highest in energy.
5.16 Predict the order of filling of subshells based upon energy.
5.17 Assign electron configurations to atoms in their ground state.
5.18 Draw orbital filling diagrams for the ground state of an atom & determine the # of unpaired electrons.
5.19 Identify atoms from orbital filling diagrams or electron configurations.
5.20 Explain the periodic trend in atomic radii.
5.21 Predict the relative size of atoms based upon their position in the periodic table.

Chapter 6 Ionic Compounds: Periodic Trends and Bonding Theory
6.1 Write ground-state electron configurations for main group and transition metal ions.
6.2 Determine the number of unpaired electrons in a transition metal ion.
6.3 Predict the relative size of anions, cations, and atoms.
6.4 Predict the relative size of isoelectronic ions.
6.5 Order elements from lowest to highest ionization energy.
6.6 Explain the periodic trend in ionization energy.
6.7 Compare successive ionization energies for different elements.
6.8 Identify elements based on values of successive ionization energies.
6.9 Compare the value of electron affinity for different elements.
6.10 Explain the periodic trend in electron affinity.
6.11 Use the octet rule to predict charges on main group ions, electron configurations of main group ions, and formulas for ionic compounds.
6.12 Visualize ionic compounds on the molecular level.
6.13 Draw a Born-Haber cycle and calculate the energy change that occurs when an ionic compound is formed from its elements.
6.14 Use the Born-Haber cycle to solve for the energy change associated with one of the steps.
6.15 Predict the relative magnitude of lattice energy given the formula or molecular representation of an ionic compound.

Chapter 7 Covalent Bonding and Electron-Dot Structures
7.1 Describe the difference between an ionic and covalent bond.
7.2 Describe changes in energy that occur as two nuclei approach to form a covalent bond.
7.3 Name a covalent compound given the chemical formula.
7.4 Predict trends in bond length and bond dissociation energy based on bond order and atomic size.
7.5 Rank elements by increasing value of electronegativity.
7.6 Classify bonds as nonpolar covalent, polar covalent, or ionic.
7.7 Visualize regions of high and low electron density in a polar covalent bond.
7.8 Predict trends in bond dissociation energy based upon both atomic size and polarity of the bond.
7.9 Explain the different physical properties of NaCl & HCl based upon the ionic & covalent bonding models.
7.10 Draw an electron-dot structure by using valence electrons to give all atoms (except H) an octet.
7.11 Use the five-step procedure for drawing electron-dot structures for all molecules including those with, expanded octets, and those containing multiple bonds.
7.12 Draw electron-dot structures for free radicals.
7.13 Draw electron-dot structures for molecules with more than one central atom.
7.14 Draw a complete electron-dot structure given only the connections of atoms.
7.15 Draw resonance structures and use curved arrows to depict how one structure can be converted to another.
7.16 Calculate formal charge on atoms in an electron-dot structure.
7.17 Use formal charge to evaluate the contribution of different resonance structures to the resonance hybrid.

Chapter 8 Covalent Compounds: Bonding Theories and Molecular Structure
8.1 Use the VSEPR model to predict geometry from the total number of charge clouds and lone pairs of electrons around an atom.
8.2 & 3 Use the VSEPR model to predict bond angles and overall shape of a molecule or ion with one or more central atoms.
8.4 Describe the difference between a sigma and pi bond.
8.5 Determine the type of hybrid orbitals based upon the number of charge clouds around an atom.
8.6 Write an electron-dot structure for a molecule and determine hybridization and bond angles on non-terminal atoms.
8.7 Identify which orbitals overlap to form sigma and pi bonds in molecules.
8.8 Predict whether a given molecule has a dipole moment and draw its direction.
8.9 Interpret electrostatic potential maps of molecules.
8.10 Calculate the percent ionic character in a bond.
8.11 Identify the types of intermolecular forces experienced by a molecule.
8.12 Relate the strength of intermolecular forces to physical properties such as melting point and boiling point.
8.13 Sketch the hydrogen bonding that occurs between two molecules.
8.14 Interpret the molecular orbital diagram for a first row diatomic molecule or ion.
8.15 Interpret the molecular orbital diagram for a second row diatomic molecule or ion. Calculate the bond order and predict magnetic properties.
8.16 Draw orbital overlap diagrams for molecules and describe the use of both valence bond theory and molecular orbital theory.

Chapter 9 Thermochemistry: Chemical Energy
9.1 Calculate the kinetic energy of an object in motion.
9.2 Convert between common units for energy.
9.3 Identify state functions.
9.4 Identify the sign of heat and work.
9.5 Calculate PV work.
9.6 Calculate the internal energy change (ΔE) for a reaction.
9.7 Given a thermochemical equation and the amount of reactant or product, calculate the amount of heat transferred.
9.8 Classify endo- and exothermic reactions.
9.9 Calculate heat capacities, temperature changes, or heat transfer using equation for heat capacity (C) specific heat (c), or molar heat capacity (C_m).
9.10 Calculate enthalpy changes in a calorimetry experiment.
9.11 Use Hess’s Law to find ΔH for an overall reaction, given reaction steps and their ΔH values.
9.12 Identify standard states of elements.
9.13 Write standard enthalpy of formation reactions (ΔH^°_f) for compounds from their elements.
9.14 Use values of (ΔH^°_f) for elements and compounds to calculate ΔH^° for a reaction.
9.15 Use bond dissociation energies to estimate ΔH^° for a reaction.
9.16 Calculate ΔH^°, for various fuels using thermochemical principles such as Hess’s Law, calorimetry, or bond dissociation enthalpies.
9.17 Predict the sign of the entropy change (ΔS) given the chemical equation or a molecular diagram.
9.18 Using the relationship between Gibbs free energy and spontaneity, predict the sign of ΔG, ΔH, ΔS.
9.19 Use the Gibbs free energy equation to calculate an equilibrium temperature.
Chapter 10 Gases: Their Properties and Behavior
10.1 Convert between different units of pressure.
10.2 Describe how a barometer and manometer measure pressure.
10.3 Use the individual gas laws to calculate pressure, volume, molar amount, or temperature for a gas sample when conditions change.
10.4 Use the ideal gas law to calculate pressure, volume, molar amount, or temperature for a gas sample.
10.5 Calculate volumes of gases in chemical reactions.
10.6 Calculate the density or molar mass of a gas using the formula for gas density.
10.7 Calculate the partial pressure, mole fraction, or amount of each gas in a mixture.
10.8 Use the assumptions of kinetic–molecular theory to predict gas behavior.
10.9 Calculate the average molecular speed of a gas particle at a given temperature.
10.10 Visualize the processes of effusion and diffusion.
10.11 Use Graham’s Law to estimate relative rates of diffusion for two gases.
10.12 Understand the conditions when gases deviate the most from ideal behavior.
10.13 Use the van der Waals equation to calculate the properties of real gases.
10.14 Convert between different units used to express the concentration of pollutants.
10.15 Use the gas laws, Dalton’s Law, and stoichiometry to calculate amounts of pollutant gases in the atmosphere.
10.16 Identify the components and causes of photochemical smog.
10.17 Explain the principle of the greenhouse effect.
10.18 Describe the trends in greenhouse gas concentrations over time and predicted effects of climate change.