Course Syllabus – SC 355 AP®Chemistry
Mississippi School for Mathematics and Science August 2017

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Office hours: MWF 2 – 4 pm;
Tues 9:30-11 am;
Thurs 2:30 – 4 pm
Appointments: tinyurl.com/TruittOffice
Tutorial: Monday 7 – 8:30 pm

Access all course documents at www.masteringchemistry.com course page

Text and References
Brown, Theodore L., H. Eugene LeMay, and Bruce Edward Bursten. (2012). Chemistry: The central science (12th ed.). New Jersey: Pearson Education.

Supplements as necessary from journals, science literature, and online sources

Course Description
The purpose of Advanced Placement Chemistry is to provide a college level course in chemistry and to prepare the student to seek credit and/or appropriate placement in college chemistry courses. A rigorous course, AP Chemistry meets each day and will delve deeply into central concepts of chemical science. Each student is expected to take the AP Exam in May.

At its core, AP Chemistry focuses on and is organized around six Big Ideas:
1. Structure of Matter
2. Physical and Chemical Properties of Matter
3. Chemical Reactions
4. Chemical Kinetics and Rates of Reaction
5. Thermodynamics
6. Chemical Equilibrium

Course Structure and Expectations
Laboratory Experiments
Laboratories are designed to utilize and reinforce the 7 science practices of AP Chemistry and encourage scientific thinking. The seven science practices are:
1. Use of models and reproductions
2. Application of mathematics
3. Use of scientific thinking/questioning
4. Planning and collection of data
5. Analysis of data
6. Application of theories to experimental data
7. Cross-domain connections within science

Safety is paramount in the laboratory. When in doubt, ask for clarification. In the case of a spill, report it immediately but do not clean it up until told to do so, the substance may have special requirements. Details will be discussed in the laboratory.

Labs will occur often and may require multiple days of experimentation and analysis. A minimum of 16 labs will be performed, with some labs involving multiple parts and covering multiple class days. Students are engaged in hands-on laboratory work, integrated throughout the course, which accounts for 30 percent of the course.

Students are expected to arrive to lab prepared. In this context, prepared means:

- Properly attired (long pants, closed toed shoes, lab coats or aprons)
- Ready to perform the experiment (pre-lab completed, procedure copied into notebook, lab handout read)
- With all appropriate materials (lab coat, lab notebook, calculator if necessary, pen – **not** pencil, etc.)

Labs are assessed with the student's lab notebook and a typed lab report. Labs are typically completed on Tuesdays and Thursdays. Lab reports are due on Friday for a Tuesday lab experiment or Monday for a Thursday lab experiment. Lab notebooks will be collected occasionally during the term.

All data from laboratory experiments is to be recorded in the lab notebook **in pen using blue or black ink**. It is not acceptable to put data on a separate sheet of paper then into the notebook. Data and observations should be recorded as the experiment is conducted. Furthermore, all calculations and analysis should be completed in the notebook prior to completing a laboratory report.

Every lab assignment must have a lab report in order to receive maximum credit. **Students are required to maintain a lab portfolio containing all lab reports.** Cite all references used with the exception of the lab handout and class notes. Proper spelling and grammar are essential. Lab reports are individual assignments and **may not** be similar between partners, with the exception of any quantitative data gathered. Different experiments may require different report formats, which will be discussed in the lab; however, every lab report will include a thorough analysis and discussion of the collected data. Students will also have to give at least one (likely more) oral and/or graphic presentation(s) of their laboratory results during the course. Parts of a written laboratory report include:

- Heading (at the top of the first page of the report)
  - Your name
  - Title of experiment (be descriptive, "Lab #1" will not receive credit)
  - Your partner's name
  - Date experiment performed
- Purpose
  - State the problem/questions clearly; substantiate the question and explain the reason for the investigation.
- Introduction (Refer to the lab handout or background information and write in your own words)
- Procedure (Refer to the handout and write in your own words)
  - Labs must have any procedural changes noted. Give explicit details of methods and give precise quantitative directions.
- Results and Analysis
  - Data must have numbers with descriptive units in correct significant figures
  - Recreate the data table from the lab notebook
  - Show samples of all calculations
- Discussion and Conclusion
  - Explain all calculations which produced data in data table
  - Be certain to address your purpose
  - Use the questions in the handout as a guide

Non-Laboratory Days

Non-lab days will proceed by a combination of discussion, modeling, problem-solving, and as little traditional lecture as possible. Non-lab days are intended to serve as a vehicle to develop principles into concepts and concepts into applications. Non-lab days will be coordinated with relevant laboratories.

Student expectations include:

- Arrive on time and prepared – in this context, prepared means:
  - Reading and homework assignments completed
  - Questions prepared on reading/homework
  - All necessary materials for notes and problem solving
  - Electronic equipment properly stowed
- Participate in class – ask questions, offer explanations and hypotheses
- Respect others' time and opinions when speaking
- Adhere to scientific discussion standards (i.e., give evidence and reasoning)
- Be bold and unafraid of "being wrong"

Some examples of non-laboratory day activities include:

- Identifying the presence of a buffer in a weak acid/strong base titration and calculating the pH at that point **(LO 6.20)**
- Applying LeChatelier's Principle to hypothetical systems and modern chemical manufacturing processes **(LO 5.16)**
- Examining the relationship between concentration, time, and order of a reaction with respect to a reactant **(LO 4.2)**
- Practice balancing redox reactions by the half-reaction method **(LO 3.8)**
- Use the concept of effective nuclear charge to infer trends in elements on the periodic table **(LO 1.9)**
- Determine intermolecular forces present in a substance from its structure and use those forces to predict the relative strength of various properties of the substance **(LO 2.16)**
- Research and discussion of electrochemical principles as they apply to modern technological advancement in high capacity batteries

Homework

An online homework system is used for this course. Homework is typically due at 11:59 pm on the day indicated on the Assignment Sheet, posted online and updated regularly. The system is robust, providing feedback for most responses and is fairly user-friendly. Students are encouraged to start early on homework and communicate with the teacher in case difficulties arise.

Grading

Grading Scale and Grade Curving

90-100	A
80-89	B
70-79	C
Below 70	NC

Due to the rigorous and intense nature of the course, a grading curve may be used. The use of a curve is at the sole discretion of the instructor. Student grades will never be lower after a curve.

Nine Weeks Grade Breakdown

50%	Tests
30%	Laboratories
10%	Quizzes and other Assignments
10%	Homework

Final Grade Breakdown

40% Each Quarter Average
20% Each Semester Exam

Late Penalty

In general, late homework is not accepted; however, exceptions may be granted for extenuating circumstances. Please speak with your instructor directly. Other out-of-class assignments, such as lab reports or projects, will be accepted with penalties outlined below. All late work must be submitted directly to the instructor.

Work turned in before 4:00 pm one day after due:	-25%
Work turned in before 4:00 pm two to seven days after due:	-50%
Work turned in more than seven days late or late homework:	-100%

At the end of the grading term (nine week period or semester), any and all work must be submitted for grading on or before the last regular class day, regardless of usual late penalties, unless otherwise specified in writing. Any work received after this deadline will not be scored and will result in no credit.

Attendance and Absences

Roll is taken every day, and the Student Handbook guidelines will be followed in dealing with absences. All discussions of missed work should occur outside of regular class time (office hours, between classes, during lunch, etc.).

In the case of planned absences, students should make arrangements to complete assignments prior to the absence, in accordance with the Student Handbook. Failure to make arrangements prior to planned absences will result in a 20% deduction on all graded work. In the event that a student is unexpectedly absent, he/she should make arrangements to complete any missed assignments immediately upon return. Failure to do so will result in a minimum 20% deduction on all graded work.

Any assignment missed due to absence that has not been completed and submitted within a reasonable time frame (usually the number of days missed), will not be accepted. This includes any and all written work. If you do not make up your missed work within the time scheduled, you will receive no credit (0%) for any missed assignments.

Academic Honesty

It is expected that each student will perform and turn in his/her own singular work. Students are encouraged to discuss material but not give each other answers or material. Academic dishonesty will be disciplined per the Student Handbook. The following are expressly prohibited and considered academic dishonesty:

- Giving or exchanging answers for homework assignments
- Sending files for/of assignments (ex: lab reports)
- Engaging in plagiarism of any document (this includes introduction and procedure given in lab handouts)
- Discussing any material on an assessment (quiz/test) with other students before the assessment is graded and returned, including topics covered, number of questions, and specifics of what was asked

Tips for Success

1. Avoid procrastination! Each lesson builds on the one before, and falling behind can lead to a cascade of problems catching up.
2. Do the homework! Consistent completion of homework is shown to increase scores in class.
3. Review and even rewrite your notes often – not only is it easier to study in smaller chunks of time, it takes less time to learn more material that way. Plan 15-20 minutes of review for each lecture/discussion period.
4. Turn in work on time! Late penalties can seriously harm an otherwise excellent grade.
5. When in doubt or in need of help, see your instructor. It is better to take one (five, ten, thirty) minute(s) to clarify something you are unsure of than to lose points on a test later.

Course Sequence (tentative)
See the **Assignment Sheet** for each nine weeks period for a more detailed day-by-day breakdown. Laboratories with an asterisk will be presented in a guided-inquiry format.

The alignment to the AP curriculum is presented with the following abbreviations and in **bold** text:
BI: Big Idea
SP: Science Practice
LO: Learning Objective

Unit, Topics, Text Sections	Laboratories
Unit 0: Measurement, Dimensional Analysis, and Introduction • SI Units (1.4) • Dimensional Analysis (1.6) • Accuracy and Precision (1.5) • Significant Figures (1.5)	1) Introduction to Scientific Reasoning, Statistics, and Data Analysis **(SP 5, 6, 7)** 2) Laboratory Safety & Equipment and Tools of Measurement
Unit 1: Structure of Matter **(BI 1)** • Atomic Structure (2.1-2.4) **(LO 1.13, 1.14)** • Molecular Structure (2.6-2.7) **(LO 1.1)** • Mixtures and Pure Substances **(LO 1.2, 1.3)** • Nomenclature (2.8) • Light and Spectra (6.1-6.3) **(LO 1.15, 1.16)** • Quantum Mechanics and Electrons (6.4, 6.6-6.9) **(LO 1.5, 1.12)** • Bonding (8.2-8.3) **(LO 2.17)** • Lewis Structures (8.1, 8.5-8.7) **(LO 2.20**) • 3D Molecular Structures and Bonding (9.1-9.6) **(LO 2.21)**	3) Flame Tests and Emission Spectra* **(SP 1, 3, 4, 5, 6, 7)** 4) Spectrophotometric Determination of Concentration **(SP 2, 5, 6, 7)** 5) Molecular Modeling I: Structure **(SP 1, 3, 6)**
Unit 2: Properties of Matter **(BI 2)** • The Periodic Table (2.5, 7.1) • Periodic Trends (7.2-7.8) **(LO 1.6, 1.7, 1.8, 1.9, 1.10, 1.11, 2.18)** • Gases and Gas Laws (10.1-10.9) **(LO 2.4, 2.5, 2.6, 2.12)** • Intermolecular Forces (8.4, 8.8, 11.1-11.5) **(LO 2.1, 2.2, 2.3, 2.7, 2.8, 2.10, 2.11, 2.13, 2.14, 2.15, 2.16, 5.9)** • Solids (12.1-12.6) **(LO 2.19, 2.20, 2.22, 2.23, 2.24, 2.25, 2.26, 2.27, 2.28, 2.29, 2.30, 2.31, 2.32)** • Modern Chemistry: Semiconductors, Polymers and Nanotechnology (12.7-12.9)	6) Solubility of Ionic Compounds* **(SP 3, 4, 5, 6)** 7) Molecular Modeling II: Intermolecular Forces **(SP 1, 3, 6)** 8) Chromatography **(SP 2, 5, 6)**
Unit 3: Chemical Reactions **(BI 1, 3)** • Stoichiometry, The Mole, and Chemical Equations (3.1-3.6) **(LO 1.4, 1.17, 1.18, 3.1, 3.2, 3.10)** • Limiting Reactant, Theoretical Yield, Percent Yield (3.7) **(LO 3.3, 3.4)** • Concentration (4.5) **(LO 2.9)** • Precipitation Reactions and Solubility (4.1-4.2) **(LO 1.19)** • Introduction to Acids and Bases (4.3) **(LO 1.20, 2.2, 3.7)** • Introduction to Redox Reactions (4.4, 20.1-20.2) **(LO 3.8)**	9) Stoichiometry of a Reaction **(LO 3.3, 3.5, 3.6; SP 2, 5, 6)** 10) Percent of Water in a Hydrate* **(LO 3.3, 3.5, 3.6; SP 2, 3, 4, 5, 6)** 11) Acid-Base Titrations **(LO 3.3; SP 1, 2, 5, 6)** 12) Redox Titrations **(LO 3.3, 3.9; SP 1, 2, 5, 6)** 13) Qualitative Analysis* **(SP 3, 4, 5, 6)**

Unit 4: Chemical Kinetics **(BI 4)** • Rate of Reactions (14.1-14.2) **(LO 4.1, 4.4, 4.5, 4.6)** • Rate Laws (14.3-14.5) **(LO 4.2, 4.3)** • Reaction Mechanisms (14.6) **(LO 4.7)** • Modern Chemistry and Biochemistry: Catalysis (14.7) **(LO 4.8, 4.9)**	14) Kinetics of a Crystal Violet Reaction* **(SP 1, 2, 3, 4, 5, 6, 7)**
Unit 5: Thermodynamics **(BI 5)** • Energy and Laws of Thermodynamics (5.1) **(LO 3.11, 5.1, 5.2, 5.3, 5.4, 5.10, 5.11)** • Enthalpy (5.3-5.4) • Calorimetry (5.5) **(LO 5.5, 5.6, 5.7)** • Hess' Law (5.6, 5.7) **(LO 5.8)** • Spontaneity and Entropy (19.1-19.4) **(LO 5.12)** • Gibbs Free Energy (19.5-19.6) **(LO 5.13, 5.14, 5.15)**	15) Coffee-cup Calorimetry **(LO 3.3, 5.7; SP 2, 5, 6, 7)** 16) Hess' Law **(SP 2, 5, 6)**
Unit 6: Chemical Equilibrium **(BI 6)** • Chemical Equilibrium and the Equilibrium Constant (15.1-15.6) **(LO 5.17, 5.18, 6.1, 6.2, 6.4, 6.5, 6.6, 6.7)** • Le Chatelier's Principle (15.7) **(LO 5.16, 6.8, 6.9, 6.10)** • Free Energy and K (19.7) **(LO 6.3, 6.25)** • Types of Acids/Bases, pH (16.1-16.4) **(LO 3.7, 6.11, 6.14, 6.15)** • Weak Acids and Bases (16.5-16.8) (**LO 2.2, 6.12, 6.13, 6.16, 6.17)** • Salts (16.9) • Buffers and the Common Ion Effect (17.1-17.3) **(LO 6.18, 6.19, 6.20)** • Solubility Equilibria (17.4-17.6) **(LO 6.21, 6.22, 6.23, 6.24)** • Voltaic Cells, Electrolytic Cells (20.3-20.4, 20.8) **(LO 3.12, 3.13)** • Free Energy and Redox (20.5) • Modern Chemistry: Batteries, Fuel Cells, Electroplating and Corrosion (20.7-20.9)	17) Spectrophotometric Determination of K **(LO 3.3; SP 2, 5, 6, 7)** 18) Volumetric Determination of K **(LO 3.3; SP 2, 5, 6)** 19) Weak Acid Titrations* **(LO 3.3; SP 1, 2, 3, 4, 5, 6)** 20) Le Chatelier's Principle **(SP 5, 6)**
Other topics, as time allows • Nuclear Chemistry (Ch 21) • Environmental Chemistry (Ch 18) • Introductory Organic Chemistry (Ch 24)	

Note: The contents of this syllabus are subject to change due to unforeseen circumstances. Changes, if necessary, will be announced in class and will be reflected on the online assignment sheet.

Syllabus References: Sample syllabuses provided by the College Board were used in the drafting of this syllabus.