

# Kolbe Academy Home School

## HIGH SCHOOL CHEMISTRY WITH LAB (HONORS)

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**COURSE TITLE:** Chemistry

**COURSE TEXTS AND MATERIALS:**

Wilbraham, Antony C., Dennis D. Staley, Michael S. Matta and Edward L. Waterman. *Pearson Chemistry*. Boston: Pearson, 2012.

Chemistry Answer Key with eText and Online Student Access. Napa, CA: Kolbe Academy Press, 2016. (optional)

*Lab Report Writing Guide*. Napa, CA: Kolbe Academy Press, 2008. (optional)

**SUPPLEMENTAL TEXTS AND MATERIALS:**

There are supplemental workbooks available for the text. Students who speak English as a foreign or second language may find *Pearson Chemistry Guided Reading and Study Workbook* helpful; students with weaker math skills may wish to use *Pearson Chemistry Skills and Math Workbook*.

If parents wish to supplement the virtual lab with small-scale chemistry experiments there are several options available. Home Science Tools offers a wide variety of kits and equipment. Such supplements are not at all necessary, but some parents prefer hands on activities to virtual labs, and such substitution is acceptable for either the K or H designation so long as lab reports are submitted in reporting packets. A basic and an AP microchemistry kit are available from Quality Science Labs, LLC. The author of *Make Magazine's Illustrated Guide to Home Chemistry Experiments* offers an all in one kit as well at his site, The Home Scientist, LLC. Parents interested in hands on lab work at home should be able to find a kit that has a price and risk factor they find acceptable.

A number of excellent web sites from chemical organizations and museums can be very helpful.

The Chemical Heritage Foundation <http://www.chemheritage.org/> offers a wealth of historical information about the discoverers of the chemical principles found in the text

The University of Nottingham, UK in partnership with documentary maker Brady Haran has produced a number of videos on chemistry including a short film on each element in the periodic table. The project may be found at <http://www.periodicvideos.com>; the site also has a YouTube channel with a helpful playlist of the elements.

Numerous other Internet resources can help students understand chemistry better including the well-known Khan Academy, the Fuse School, or Tyler DeWitt's YouTube Videos.

Check URLs as they may change.

**COURSE DESCRIPTION:**

This course is designed to give students an appreciation of creation and of the order and complexity of atoms and their interactions with each other. The course plans outline a track for a Kolbe Academy honors course (H) in Chemistry. The "Honors Chemistry" track emphasizes basic chemical interactions between atoms, compounds and molecules, and will also delve more deeply into the theoretical, mathematical, and organic chemical processes.

This course provides an introduction to chemistry suitable for students in a college preparatory program. The honors track, although up to the parent's discretion, is aimed for students who have previously had a solid background in physical science. A student who still wishes to pursue this course as an honors course that did not follow the recommended course of study for physical science may find that the pace of the course very quick and should be sure to allot extra time for their studies. The honors track should be followed if students wish to have the opportunity to take the AP test in Chemistry. Since this book is NOT a college text, it is important to study for the AP with an AP specified study guide for Chemistry. Most of the topics needed to be successful on the Chemistry AP exam are covered in the honors course of study. To see the AP chemistry requirements, go to [www.collegeboard.com](http://www.collegeboard.com).

**SCOPE AND SEQUENCE:**

1. Introduction to Chemistry
2. Electrons and the Structure of Atoms
3. Bonding and Interactions
4. Reactions
5. Kinetic Theory
6. Moles and Quantification
7. Matter, Energy, and Change
8. Organic and Biological Chemistry(Honors Only)
9. Nuclear Chemistry (optional)

The honors track, although up to the parent's discretion, is aimed for students who have previously had a solid background in physical science. A student who still wishes to pursue this course as an honors course that did not follow the recommended course of study for physical science, may find the pace of the course challenging. These students should be sure to allot extra time for their studies.

**DIPLOMA REQUIREMENTS:**

The honors track, although up to the parent's discretion, is aimed for students who have a solid background in physical science. A student who still wishes to pursue this course as an honors course but did not follow the recommended course of study for physical science, may find the pace of the course challenging. These students should be sure to allot extra time for their studies.

**Summa Cum Laude** diploma candidates are required to follow either the Kolbe Core course (K) or Kolbe Honors course (H) track outlined in the course plan, and are required to fulfill the laboratory component with this chemistry course (see page 5). **Magna Cum Laude** and **Standard** diploma candidates may choose to pursue the (H) or (K) designation, but are not required to do so, and instead have the option of altering the course plan as they choose. **Summa** students must complete 4 years of science during their high school course of study including Chemistry with Lab, Chemistry with Lab, Physics with Lab, and a pre-approved science elective. **Magna** students must complete 3 years of science during their high school course of study including Chemistry, Chemistry, and a physical science. **Standard** diploma students must complete 2 years of science including a biological and physical science. For a student pursuing the **Magna Cum Laude** diploma, the science requirement dictates that lab work is incorporated into two of the following three courses: Chemistry, Chemistry or Physics. There is no lab requirement for the **Standard** diploma. Please see below for specific course titles, semester reporting requirements and transcript designations for chemistry.

### KOLBE HONORS (H) HIGH SCHOOL COURSES:

- ❖ Students pursuing the Kolbe Honors (H) designation should do the readings and problems indicated and use the weekly tests and quarterly exams provided.
- ❖ To receive the Kolbe Honors (H) designation on the high school transcript, be sure to turn in the appropriate sample work, as outlined below.

### SEMESTER REPORTING REQUIREMENTS:

Designation*	H		H
Course Title	Chemistry w/ Lab		Chemistry w/ Lab
<b>Semester 1</b>	1. Exam I (Honors) answered fully 2. 1 lab report 3. Exam II(Honors) answered fully 4. 1 lab report	<b>Semester 2</b>	1. Exam III (Honors) answered fully 2. Exam IV (Honors) answered fully 3. 1 lab report 4. Exam V (Honors) answered fully 5. Exam VI (Honors) answered fully 6. 1 lab report

\*Designation refers to designation type on transcript. H designates a Kolbe Academy Honors course.

If the student wishes to have the course distinguished on the transcript with an (H) as a Kolbe Academy Honors course, please be sure to send the correct exams and components each semester for verification as specified above. **If no designation on the transcript is desired, parents may alter the lesson plan and any written sample work is acceptable to receive credit for the course each semester.** If you have any questions regarding what is required for the (H) designation or diploma type status, please contact the academic advisory department at 707-255-6499 ext. 5 or by email at [advisors@kolbe.org](mailto:advisors@kolbe.org).

### COURSE PLAN METHODOLOGY:

There are 30 chapter quizzes. Students should do the assigned readings and problems, have their answers corrected, and then review the chapter before taking the chapter quiz. These short tests check the student's mastery of each chapter. There are also 6 exams incorporated into the chemistry course. These exams reflect the content of what was assigned in the weekly course plans. If students do the work assigned during the week, they should be adequately prepared for any question that arrives on the exams. The exams consist of many different types of questions including matching, multiple choice, and essays. In order to receive the Kolbe Honors course designation (H) on their transcript, students must complete all the sections on the exams that are labeled "Honors Chemistry". Students may not skip or alter questions on the exams except when specified by the directions within the exam itself if they wish to receive either the (H) or (K) designation for this course. As parents are the primary educator, they may alter the course plan or exams as needed if the student does not desire the (H) or (K) designation on the transcript.

Lab work is suggested throughout the lesson plan through the use of the Virtual Lab CD and labs in the textbook that do not require extensive materials. To qualify the course as a lab science, students should spend an average of one hour per week doing some type of lab work. This may include quick labs, micro-labs, or the virtual laboratory CD. Students may receive lab credit by other means than following the course plan suggestions such as a home school co-op, hands-on lab at home, college lab course etc. A separate grade should NOT be given for the lab work, but should be incorporated into the overall grade given for the course. Parents may determine the weight the lab component will have on the final grade, but typical values ranges from 15-25% of the total grade. Two written lab reports (formal or informal) are needed per semester for lab credit on the transcript; however, students are encouraged to write an informal lab report for the majority of the labs in this course.

If this text is being used in preparation for the AP Chemistry exam, students should complete assignments under the Honors Chemistry heading. Since this book is NOT a college text, it is important to study for the AP with an AP specified study guide for Chemistry. Most of the topics needed to be successful on the Chemistry AP exam are covered in the honors course of study. The Chemistry AP test is usually given near May 1<sup>st</sup>, so parents who have the flexibility to do so may prefer to begin their course at the beginning of August in order to cover all topics by the end of April. To see the AP chemistry requirements, go to [www.collegeboard.com](http://www.collegeboard.com). AP is a registered trademark of the College Board.

**The following key will help the parent and student understand how each week's assignments are laid out:**

**Reading:** Includes pages from the specified chapter in the Prentice Hall *Chemistry* textbook or other specified outside reading.

**Section Assessment:** Suggested questions from the text at the end of each section. Answers to these questions are provided in the Kolbe Academy Answer Key to the Prentice Hall Chemistry text.

**Chapter Assessment:** Suggested questions from the text at the end of each chapter. The suggested questions will help the student prepare well for each exam provided by Kolbe Academy. Answers to these questions are provided in the Kolbe Academy Answer Key to the Prentice Hall Chemistry text. Review questions for previous sections are also included

**Go Online:** The text has a supplemental website provided by Prentice Hall at [www.successnetplus.com](http://www.successnetplus.com). The material assigned in the "Go Online" is meant to be supplemental in nature and is not absolutely necessary to do well on the exams. However, it does provide additional assessment and demonstration of the concepts in the text.

**Lab Work:** The lab work assignments come from either the Virtual Chemistry Labs or from the *Chemistry* text itself. The labs chosen from the text need little or no equipment to be completed at home (such the Quick Labs or Inquiry activities), and all Virtual Chemistry Lab assignments use just computer software. Any Quick Labs or Inquiry activities listed in the course plan are optional for lab credit but do allow students using the Virtual Lab software to get some occasional hands-on lab experience. Note that virtual labs have been placed in the most relevant week possible, but sometimes a lab covering a certain topic is postponed to a later week so as not to overwhelm the student.

**Key Terms:** This is a list of important vocabulary terms to look out for as the student reads the chapter.

**Important Concepts:** The most important concepts for the student to understand are described in this section.

**Quiz:** A short quiz on the current chapter.

**Optional:** Suggestions for additional reading or research

**Exam:** There are six exams. Each exam covers several weeks of related material

## ◆◆◆ FIRST SEMESTER ◆◆◆

WEEK 1		
<b>Reading</b>	Chapter 1 Chapter 2	Sections 1.1 pp. 2-5, 1.2 p. 8-9, 1.3 pp. 14-17 Sections 2.1 – 2.4
<b>Section Assessment</b>	Chapter 1 Chapter 2	2-4, 14-15 1-4, 12-14, 21, 22-23, 32-33, 36-37
<b>Chapter Assessment</b>	Chapter 1 Chapter 2	34, 36, 39-40, 53, 55, 57, 60
<b>Go Online</b>	Chapter 1 Chapter 2	Kinetic Art: Molecular Models Chem Tutor: Estimated Walking Time Math Tutor: Equations States of Matter
<b>Lab Work</b>	Students should familiarize themselves with the scientific method and the basics of science writing. This can be done independently, or using <i>The Kolbe Academy Lab Report Guide</i> . There is no formal lab assignment this week. <b>Optional:</b> Quick Labs, page 17	
<b>Quiz</b>	Weekly Quiz #1	
<b>Optional</b>	End each day with a short periodic table video from the periodic table of videos by Brady Haran and the University of Nottingham staff. Start with Hydrogen, Helium and Lithium (the first three elements of the periodic table).	
<b>Key Terms</b>	manipulated variable solid liquid gas vapor mixture heterogeneous mixture homogeneous mixture solution phase filtration distillation element compound chemical change	

	chemical symbol periodic table period group chemical property chemical reaction reactant product precipitate law of conservation of mass Antoine Lavoisier
<b>Important Concepts</b>	<p>Although there appears to be quite a bit of material covered, <u>much of this week's readings are a review of concepts covered in previous science classes.</u> All of the material either reviews previous science material or previews later chapters. Students should feel free to skim this week's reading for major concepts. Only one day need be spent on Chapter 1.</p> <p><b>Students should concentrate more heavily on the concepts in Chapter 2.</b> If the student has not had an in-depth physical science background, it is important to concentrate on understanding the three physical states of matter (solid, liquid, and gas), as well as the differences between physical and chemical changes, and the differences between homogenous and heterogeneous mixtures.</p> <p>Students should get into the habit of reviewing the study guide at the end of each chapter as they read. The guide is divided into sections and includes vocabulary and key ideas.</p> <p>Students should take particular note of the Big Idea at the top of the page.</p>
Notes	

WEEK 2		
<b>Reading</b>	Chapter 3	Sections 3.1-3.2
<b>Section Assessment</b>	3.1	1-11 (students will find these practice problems after each sample problem) 13-17
	3.2	19-22, 28-31
<b>Chapter Assessment</b>	Chapter 3	57-60, 62-67, 69
<b>Go Online</b>	3.1 3.2	Significant figures, Precision in Measurement SI Units Exactly, Converting between Temperature Scales, Density of Solids and Liquids
<b>Lab Work</b>	Quick Lab p. 39 (a white coffee filter can be cut to make the filter strip). <u>Write up</u> observations according to the Kolbe Lab Guide.	
<b>Quiz</b>	Weekly Quiz #2	
<b>Optional</b>	Periodic videos (see week <b>Optional</b> week 1) Beryllium, Boron, Carbon	
<b>Key Terms</b>	kilogram (kg) gram (g) weight temperature energy joule (J) calorie (cal) Celsius scale Kelvin scale absolute zero density	
<b>Important Concepts</b>	If necessary, students should practice scientific notation. All students will be expected to present their answers with the correct number of significant figures from this point forward. <b>Answers should not be considered entirely correct unless they are reported using the correct number of significant figures</b> Students should know the equation for density by memory (density = mass/volume) and understand how to manipulate this equation. The most common unit used for density is g/cm <sup>3</sup> , but g/mL is another unit used especially for the density of liquids. Conversions to note: cm <sup>3</sup> ↔ mL (1 cm <sup>3</sup> = 1 mL).	
<div style="border: 1px solid black; padding: 2px; display: inline-block;">Notes</div>		

WEEK 3		
<b>Reading</b>	Chapter 3 Chapter 4	3.3, 4.1
<b>Section Assessment</b>	3.3, 4.1	36,38,40, 53-54 1-7
<b>Chapter Assessment</b>	Chapter 3 Chapter 4	74-75, 86, 87, 89, 91, 94, 97 35-37
<b>Go Online</b>	3.3	Conversion Factors, Using Dimensional Analysis Using Density as Conversion Factor, Converting Ratios of Units
<b>Lab Work</b>	Online textbook The Density of Solids and Liquids	
<b>Quiz</b>	Weekly Quiz # 3	
<b>Optional</b>	<p>Periodic videos (see week <b>Optional</b> week 1) Nitrogen, Oxygen</p> <p><u>Atoms and the Classical Curriculum</u> While most chemistry belongs to the modern era, its roots stretch back to thinkers that students may be familiar with from the classical curriculum. The following points may be integrated with the student's current historical and literary studies, now or later in the course, and can be researched in greater detail by the student if the parent wishes:</p> <p><b>Ancient Greece:</b> Democritus is generally considered to be the founder of atomism. Most works do not survive but his ideas come to us through the much later historian Diogenes Laërtius. Aristotle disagreed and thought matter was composed of four elements: earth, water, fire, and air. This is outlined in Aristotle's <i>On Generation and Corruption</i> and <i>Meteorology</i>. Aristotle's view prevailed for over a thousand years.</p> <p><b>Ancient Rome:</b> Lucretius was a poet and philosopher whose <i>De Rerum Natura</i> (On the Nature of Things) imagines a permanent universe made up of perpetually moving particles that come together to make matter, a relationship between atoms and void.</p> <p><b>Middle Ages:</b> St. Albert Magnus is a Doctor of the Church, the patron saint of scientists, and the teacher of St. Thomas Aquinas. His studies were devoted to unifying the Greek thought of Aristotle with Christianity. He traveled a great deal while researching ancient texts, and during his travel made numerous observations about minerals, collected in his work <i>De Mineralibus</i>. He took the Aristotelian (not atomic) view of matter, and even though his work was later superseded, he was a key figure in the development of chemistry. He is often thought of as the archetypical alchemist, and many folk tales were written about him. Roger Bacon, a Franciscan friar, seems to have done early work with gunpowder and is credited with moving science ("natural philosophy") closer to the scientific method in <i>De Scientia Experimentalis</i> (On Experimental Knowledge). Like Albertus Magnus, he too was the subject of many folk tales and legends about alchemy.</p>	

## ◆ COURSE PLAN ◆

<b>Key Terms</b>	3.3  4.1	conversion factor dimensional analysis atom Dalton's Atomic theory scanning tunneling microscope size range of atomic radii
<b>Important Concepts</b>		The section on conversions may have been covered in a previous physical science course. It is absolutely essential that students understand the process of converting from one unit to another and how to represent figures in scientific notation. These skills will be used over and over again in this course
<div style="border: 1px solid black; padding: 2px; display: inline-block;">Notes</div>		