TEXAS TECH UNIVERSITY
TTU K-12

Chemistry (CHEM) 1B
Syllabus

Course Name

CHEM 1B

Chemistry – Semester B

Course Information

CHEM 1B is the second semester of this two-semester course.

In this course, you will learn several important concepts. The topics included in this semester are:

- naming and writing formulas
- the ability to extract information from the Periodic Table of Elements
- writing and balancing chemical equations
- using the chemical equation to solve problems concerning:
    - amounts of material
    - volumes of gases
    - energy requirements for chemical reactions to occur

This content is covered over two semesters to give you time to master these concepts.

You will systematically study the information in the textbook (it's important that you have the Texas version—see the **Textbook and Materials** section below). When you read each chapter, be sure to take notes and review them briefly before attempting the quizzes and graded assignments. For extra practice, attempt to solve the sample problems if you need help understanding certain concepts. You should spend about two to three hours on each reading, making sure you can define and apply the concepts discussed. Lessons 11 and 12 are often more difficult for students, so be prepared to spend extra time on them.

Complete each lesson in its entirety before moving on to the next lesson. Chemistry builds concepts upon concepts, much like a brick wall. The first layer must be in place before the next layer can be built. If you don't understand the first set of concepts, your chances of mastering the next layer will likely be more difficult.

Course Delivery Method

Online

Contacting Your Instructor

You may contact your instructor through the Blackboard messaging system. Technical support is available 24/7 at www.k12.ttu.edu.

Course Objectives

After completing this course, you should be able to:

1. conduct laboratory investigations;
2. use scientific methods during investigations;
3. make informed decisions using critical thinking and scientific problem-solving;
4. compare and contrast the mole as a number and the mole as a mass;
5. relate counting particles to weighing samples of substances;
6. solve stoichiometric problems using molar mass;
7. predict quantities of reactants and products in chemical reactions;
8. determine mole ratios from formulas for compounds;
9. identify formulas of compounds by using mass ratios;
10. demonstrate the uniqueness of water as a chemical substance;
11. model the three-dimensional geometry of a water molecule;
12. relate the physical properties of water to the molecular model;
13. compare and contrast the ability of water to dissolve ionic and covalent compounds;
14. distinguish solutions from colloids;
15. compare and contrast colligative properties;
16. distinguish acids from bases by their properties;
17. relate acids and bases to their reactions in water;
18. evaluate the central role of water in the chemistry of acids and bases;
19. relate different electrical conductivities of acidic and basic solutions to their degree of dissociation or ionization;
20. distinguish strong and weak acids or bases by their degree of dissociation or ionization;
21. compare and contrast the composition of strong and weak solutions of acids or bases;
22. relate pH to the strengths of acids and bases;
23. analyze the characteristics of an oxidation-reduction reaction;
24. distinguish between oxidation reactions and reduction reactions by definition;
25. identify the substances that are oxidized and those that are reduced in a redox reaction;
26. distinguish oxidizing and reducing agents in redox reactions;

27. analyze common redox processes to identify the oxidizing and reducing agents;
28. write and interpret structural formulas of linear, branched, and cyclic alkanes, alkenes, and alkynes;
29. distinguish among isomers of a given hydrocarbon;
30. infer the relationship between fossil fuels and organic chemicals;
31. compare and contrast the structures of the major classes of substituted hydrocarbons;
32. summarize properties and uses of each class of substituted hydrocarbons;
33. understand entropy and track its role in various processes;
34. understand the technique of calorimetry and illustrate its use;
35. compare and contrast alpha, beta, and gamma radiation;
36. apply the concept of half-life of a radioactive element; and
37. understand nuclear fission and nuclear fusion.

CHEM addresses the required Texas Essential Knowledge and Skills (TEKS). These can be found at the Texas Education Agency website.

Textbook and Materials

Textbook(s)

The **required** digital textbook for this course is:

- Staley, D., Wilbraham, A., & Waterman, E. (2015). *Texas Chemistry*. Boston, MA: Pearson. ISBN 0133262510

This digital textbook can only be purchased through the TTU K-12 partner bookstore. You can find the link to the bookstore in the Current Students section of the TTU K-12 website. Once you have purchased the digital textbook, you will receive a username and password via email.

Additionally, you will need an online account at Savvas Realize in order to access your textbook, course videos, the learning activities, and other online resources.

If you would like a printed book, you can purchase the **optional** printed text:

- Staley, D., Wilbraham, A., & Waterman, E. (2015). *Texas Chemistry*. Boston, MA: Pearson. ISBN 0-328-76346-2

Please note that you will not be able to access any of the digital resources if you purchase only the printed textbook.

We will cover all the TEKS required by the state of Texas. **It is essential that your textbook be the Texas version.** All page numbers and referrals will be to that version.

Before you can complete the first laboratory assignment, you must complete the **Chemistry Safety Quiz** in **Lesson 11 Lab Assignments**. While many of you will not

have access to a lab, there are those who will. Safety is of utmost importance in any lab, especially in the chemistry lab.

Lab Materials

Below is a list of supplies you will need to complete the laboratory exercises for this course. Review the labs themselves for more details. Review the **Laboratory Exercises** information in this Syllabus for important information regarding how to write your lab reports and **lab safety**.

Lesson 11 Lab – Kitchen Chemistry

- paper cups
- baking soda
- water
- vinegar
- lemon juice
- spoon
- eyedropper

Lesson 13, Lab – The Kinetic Molecular Theory

- food coloring
- 3 clear containers of equal size (plastic cups, glass bowls, etc.)
- timer or stopwatch
- measuring cup
- thermometer (preferably Celsius scale) *Note: Sometimes a cooking meat thermometer can be used in liquids
- hot, cold, and room temperature water

Lesson 14 Lab – Carbon Dioxide from Antacid Tablets

- 6 effervescent antacid tablets (e.g., Alka-Seltzer tablets)
- 3 spherical rubber balloons
- plastic medicine dropper
- water
- clock or watch
- metric tape measure (may substitute English tape measure)
- graph paper

Lesson 16 Lab – Solutions and Colloids

- baking soda (sodium hydrogen carbonate $NaHCO_3$)
- corn starch
- stirring rod (or spoon)
- water
- flashlight
- masking tape

- 3 jars with parallel sides
- teaspoon
- cup

Lesson 17 Lab – Heat of Fusion of Ice

- 100 ml graduated cylinder
- hot tap water
- foam cup
- thermometer (preferably Celsius scale)
- ice

Lesson 18 Lab – Indicators from Natural Sources

- red cabbage leaves
- 1-cup measure
- hot water
- 2 jars
- spoon
- cheesecloth
- 3 sheets plain white paper
- transparent tape
- metric ruler
- pencil
- 10 small clear plastic cups
- permanent marker
- white vinegar (CH_3COOH)
- baking soda ($NaHCO_3$)
- spatula
- household ammonia
- dropper
- assorted household materials

Other Required Materials

- several sharpened No. 2 pencils
- lined notebook paper
- calculator (standard or scientific)

Technical Requirements

- Internet access – preferably high speed (for accessing Blackboard)
- Email
- Word processing software such as Microsoft Word
- Adobe Reader (download from Adobe.com)
- Audio and video capabilities (for watching/listening to course content)

- PDF app (free options available)

Technical Skill Requirements

Be comfortable with the following:

- using a word processor
- Internet search engines and browsers
- creating PDFs (see **Requirements for Creating PDFs** in the Syllabus section of your course)

Course Organization

This course consists of 11 lessons and a final examination. Each lesson contains the following:

- Introduction and Instructions
- Learning Objectives and Curriculum Standards
- Learning Activities
- Assignments

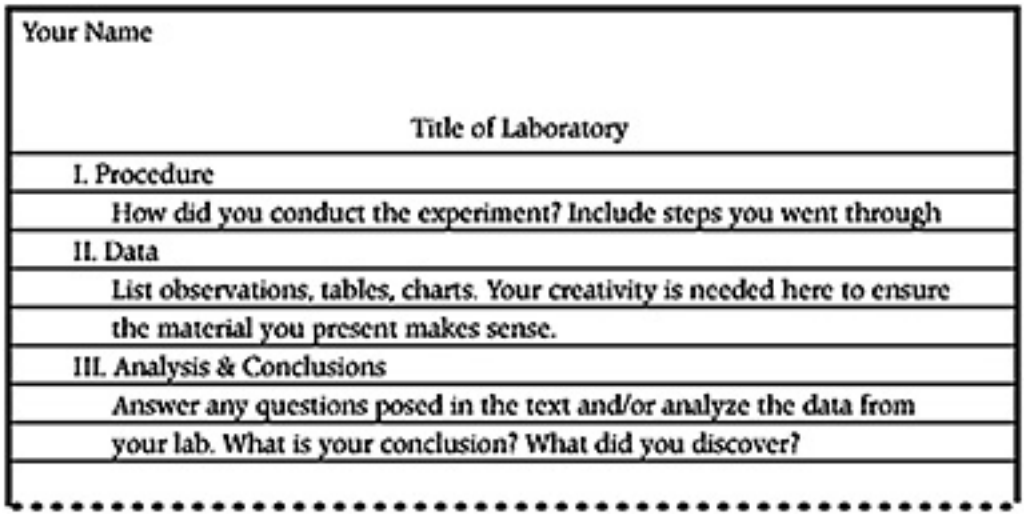
Each lesson includes several activities that present content knowledge. Each lesson also includes multiple graded assignments to ensure that you learn the content that has been presented in the activities. Some of the assignments are automatically-graded quizzes, and some are written assignments or activities that your instructor will grade. Be sure you read all instructions carefully and ask your instructor for help if something is not clear.

Laboratory Exercises

Lab Reports

Lab assignments are found in either the textbook or in the course only. You need to use a word processor such as Microsoft Word, Microsoft WordPad, OpenOffice.org Writer, or Notepad to write your lab report. Use the following format to write your labs:

continued →



Always follow this format when you submit a lab. Writing lab reports is standard procedure in science because it allows others to read about and understand what you did. It also gives others the opportunity to duplicate your experiment. Scientists know the scientific community may dismiss an experiment that can't be duplicated.

Write your laboratory procedures for each lab carefully; they account for a large part of each lesson grade. Your instructor will use a general lab rubric to grade your lab reports, and you'll also get individual feedback on them wherever it is needed. See the **Chemistry 1B Lab Rubric** in the Syllabus and Resources sections of the course.

Enjoy the laboratory exercises; they make the course fun. When you conduct the labs, be sure you follow basic safety protocols. Carefully read the **Safety and Investigative Skills Handbook** section in your textbook on pages R42-R45 to learn more about safety in the lab.

Safety

During your labs you may encounter an **SDS**, or Safety Data Sheet. Safety Data Sheets may be known as Material Safety Data Sheets or MSDS. Each country used to have its own requirements for the MSDS sheets, but the new SDS system standardized these sheets for all countries.

Each sheet is a form with data regarding the properties of a specific substance and provides workers and emergency personnel with procedures for working with the substance in a safe manner. It includes information on physical data (melting and boiling points, flash points, etc.), toxicity, health effects, first aid, reactivity, storage disposal, protective equipment, and spill-handling procedures. It usually indicates the proper labeling of a substance's health and/or environmental risks. If you look at the **Sample MSDS sheet for the product Neutra** in the Syllabus section of the course, you will find one form of the sheet with separate sections for identification of the chemical, hazardous ingredients, physical data, fire and explosion data, health hazard data, reactivity data, spill or leak procedures, special protection information outlining equipment needed to handle the substance, special precautions, and any revised

information available. These sheets are reviewed every 3-5 years and revised as needed. For more information about how to read an MSDS sheet, watch the Navigating a MSDS Sheet video.

Safety Data Sheets are not usually intended for use by the general consumer since they are written for the workers exposed to the materials. Nearly all require information on the flammability, corrosiveness, and radioactivity levels as needed for each substance. Any chemical laboratory is required to keep these sheets in a known location for reference and safety.

Review the **Safety and Investigative Skills Handbook** section in your textbook on pages R42-R45 **before starting *any* experiment**. Remember, safety is your first consideration in any laboratory. **Follow all cautions carefully.**

Course Outline

Please note that some assignments will be hidden from you when you start the course. As you move through the lessons and complete assignments, more will unlock for you.

Lesson	Topic	Approximate Time for Completion
Lesson 11	Chemical Reactions	1.5 weeks
Lesson 12	Stoichiometry	1.5 weeks
Lesson 13	States of Matter	1.5 weeks
Lesson 14	The Behavior of Gases	1.5 weeks
Lesson 15	Water and Aqueous Systems	1.5 weeks
Lesson 16	Solutions	1.5 weeks
Lesson 17	Thermochemistry	1.5 weeks
Lesson 18	Acids, Bases, and Salts	1.5 weeks
Lesson 19	Oxidation-Reduction Reactions	One week
Lesson 20	Hydrocarbon Compounds	1.5 weeks
Lesson 21	Nuclear Chemistry	1.5 weeks
Final Exam		

continued →

Assignment Schedule

Each of the following must be completed to complete the course. Items with an asterisk (*) indicate that these are summative assessments for the course.

Lesson	Weeks	Assignments
11	1	Checkpoint 1 (Non-graded) Lesson 11.1 Assignment Activity: Describing Chemical Reactions Lesson 11.1 Assignment Activity: Balancing Equations Lesson 11.2 Assignment Activity: Types of Reactions Lesson 11.3 Assignment Activity: Reactions in Aqueous Solution Lesson 11.3 Discussion Chemistry Safety Quiz Lesson 11 Assignment Upload: Lab – Kitchen Chemistry
12	2-3	Lesson 12.1 Assignment Upload: The Arithmetic of Equations Lesson 12.1 Discussion Lesson 12.2 Assignment Upload: Chemical Calculations Lesson 12.3 Assignment Upload: Limiting Reagent and Percent Yield
Exam 1		*Exam 1 – Chapters 11-12
13	3-4	Lesson 13.1 Quiz Lesson 13.2 Quiz Lesson 13.3 Quiz Lesson 13.4 Quiz Lesson 13.4 Discussion Lesson 13 Assignment Upload: Lab – The Kinetic Molecular Theory Checkpoint 2 (Non-graded)
14	5-6	Lesson 14.1 Quiz Lesson 14.1 Discussion Lesson 14.2 Quiz Lesson 14.3 Quiz Lesson 14.4 Quiz Lesson 14 Assignment Upload: Lab – Carbon Dioxide from Antacid Tablets
15	6-7	Lesson 15.1 Quiz Lesson 15.2 Quiz Lesson 15.3 Quiz Lesson 15.3 Discussion Lesson 15 Assignment Upload: Lab – Surface Tension

Lesson	Weeks	Assignments
16	8-9	Lesson 16.1 Quiz Lesson 16.2 Quiz Lesson 16.3 Quiz Lesson 16.4 Quiz Lesson 16.4 Discussion Lesson 16 Assignment Upload: Lab – Solutions and Colloids
Exam 2		*Exam 2 – Chapters 13-16
17	9-10	Lesson 17.1 Quiz Lesson 17.2 Quiz Lesson 17.3 Quiz Lesson 17.4 Quiz Lesson 17.4 Discussion Lesson 17 Assignment Upload: Lab – Heat of Fusion of Ice
18	11-12	Lesson 18.1 Quiz Lesson 18.2 Quiz Lesson 18.3 Quiz Lesson 18.4 Quiz Lesson 18.5 Quiz Lesson 18.5 Discussion Lesson 18 Assignment Upload: Lab – Indicators from Natural Sources
19	12-13	Lesson 19.1 Quiz Lesson 19.2 Quiz Lesson 19.3 Quiz Lesson 19.3 Discussion
Exam 3		*Exam 3 – Chapters 17-19
20	13-14	Lesson 20.1 Quiz Lesson 20.2 Quiz Lesson 20.3 Quiz Lesson 20.4 Quiz Lesson 20.5 Quiz Lesson 20.5 Discussion Lesson 20 Assignment Upload: Lab – Hydrocarbon Isomers
21	15-16	Lesson 21.1 Quiz Lesson 21.2 Quiz Lesson 21.3 Quiz Lesson 21.4 Quiz Lesson 21.4 Discussion

Lesson	Weeks	Assignments
		Lesson 21 Assignment Upload: Lab – Pennium Checkpoint 3 (Non-graded)
Exam 4		*Exam 4 – Chapters 20-21
		Final Exam

Course Credit

The course grade will be calculated as follows:

- 50% coursework average;
- 50% summative assessment average, including the final exam;
- A passing course grade is 70 or higher.

Students must attempt all assignments in the course. The final exam will not be available until all assignments have been accepted and graded by the teacher.

Students who score below 70% on the final exam will be eligible for one re-exam opportunity.

Coursework

The graded assignments within each lesson are formative in nature. This means that they are designed to assist you in applying and demonstrating the lesson concepts, as well as identifying areas in which you need additional review. You may use all the lesson's learning activities to assist you as you complete the graded assignments.

Summative Assessments

Summative assessments are those that allow you to demonstrate mastery of the course objectives. For summative assessments, you will NOT be allowed to use the learning materials. These are opportunities for you to show what you have learned by that point in the course. Summative assessments may be proctored using the online proctoring system Proctorio. Information about Proctorio is provided in **Remote Proctoring** in the Syllabus section of your course. The summative assessments for this course are as follows:

- Summative Assessments **(20% of Course Grade)**
  - Exam 1 (30 points)
  - Exam 2 (40 points)
  - Exam 3 (40 points)
  - Exam 4 (20 points)
- Summative Final Exam **(30% of Course Grade)**

Course Completion

- Students may not complete the course in less than 30 days.
- All courses expire six months after the enrollment date.

Academic Integrity

It is the aim of the faculty of Texas Tech University to foster a spirit of complete honesty and high standard of integrity. The attempt of students to present as their own any work not honestly performed is regarded by the faculty and administration as a most serious offense and renders the offenders liable to serious consequences, possibly suspension.

“Scholastic dishonesty” includes, but is not limited to, cheating, plagiarism, collusion, falsifying academic records, misrepresenting facts, and any act designed to give unfair academic advantage to the student (such as, but not limited to, submission of essentially the same written assignment for two courses without the prior permission of the instructor) or the attempt to commit such an act.

Student Expectations

You will be expected to log into the Blackboard course regularly to be aware of possible announcements/reminders and to pace your progress in the course.

Students are expected to maintain an online environment conducive to learning, which includes “netiquette” (Internet etiquette). Please review the basic rules for Online Discussion Netiquette. Ensure that your email messages, discussion board postings, and other electronic communications are thoughtful and respectful. Diverse opinions are welcome in this course, and you are expected to demonstrate an open mind and courtesy when responding to the thoughts and ideas of others.

The following are prohibited:

- making offensive remarks in email or the discussion board;
- using inappropriate language or discussing inappropriate topics online;
- spamming;
- hacking;
- using TTU or Blackboard email or discussion boards for commercial purposes;
- using all caps (considered shouting in online communications); and
- cyber-bullying or online harassment of any type.

Inappropriate behavior shall result in consequences ranging from a request to correct the problem, to removal from the course or even the university, depending on the severity of the behavior. Disciplinary actions will be taken according to the TTU K-12 Student Handbook.

Communication

- You can expect a reply from your instructor within 2 business days.
- Use the Blackboard Course Messages tool for sending messages to your instructor.

Submitting Assignments

You will submit all assignments through the Blackboard Assignment Tool, rather than by mail or email.

Technical Difficulties

Getting Help

For student assistance with Blackboard, visit TTU K-12 Support.

Computer Problems

A working computer is necessary for online coursework. Computer problems will not be accepted as a valid reason for failure to complete course activities within the allotted time frame. Identify a second computer, before the course begins, that you can use if you experience computer problems.

Server Problems

When the Blackboard server needs to be taken down for maintenance, the Blackboard administrator will post an announcement in your course informing you of the time and date. If the server experiences unforeseen problems, your course instructor will notify you.

Lost or Corrupted Files

You must keep/save a copy of every project/assignment on an external disk or personal computer. In the event of any kind of technology failure (e.g., Blackboard server crash or virus infection, students' own computer problems, loss of files in cyberspace, etc.) or any disputes, the instructor may request or require you to resubmit the files. In some instances, the instructor may need to open another attempt within Blackboard, so communication with your instructor is critical in these circumstances.