

Science 1A – Introductory Chemical and Physical Science

Course Section: 80222 Term: Spring 2019

Lecture: Room AC1-106, Tuesdays & Thursdays 4:00 – 5:15 pm

Lab: Room AC2-238 Tuesday 5:30 - 8:20 pm

Instructor: Dr. Craig Van Degrift

e-mail: science1a@yosemitefoothills.com

Always also CC to: craig.vandegrift@scccd.edu

The first half of the semester covers physics - mechanics, fluid dynamics, thermodynamics, electricity & magnetism, and light & sound waves.

The second half covers chemistry - atomic structure, radioactivity, chemical compounds, chemical reactions, and organic molecules.

The official description of this course can be found at <http://www.cloviscollege.edu/index.aspx?page=1170>.

Student Learning Outcomes:

Upon completion of this course, students will be able to:

1. Correctly analyze natural phenomena using the concepts of physics and chemistry.
2. Investigate physical phenomena using appropriate equipment and methods, make valid comparisons with theoretical predictions, and communicate those results.
3. Gain an intuitive understanding of physics, chemistry, and the process of scientific investigation.
4. Become skilled at using simple formulas connected with natural phenomena and the metric units of measurement for related quantities.
5. Learn how to reliably measure these quantities, particularly ones that we cannot sense directly.
6. Gain experience with graphical analysis of data and the reality of random measurement errors.
7. Become able to understand technical specifications of equipment and components used in science and technology.

Official Objectives:

In the process of completing this course, students will:

1. Describe the states of matter and associate phase changes.
2. Classify matter as elements, compounds, mixtures and describe properties of each.
3. Describe basic atomic structure including the fundamental particles and electron energy levels.
4. Explain the history and structure of the periodic table.
5. Explain and describe different ways atoms combine to form compounds.
6. Describe the motion of objects as related through the concepts of position, displacement, speed, velocity and acceleration.
7. Use Newton's Laws to predict and explain the motion of an object.
8. Discuss the type of energy present in a system and use conservation of energy to solve problems.
9. Explain the requirements for a complete circuit in terms of a model of electric charge.
10. Describe color perception based on the wave nature of light and its interactions.

Laboratory Objectives:

11. Understand fundamentals of taking and recording measurements including measuring length, area, volume, mass, density, significant figures, converting between units and scientific notation.
12. Practical applications to both the chemistry and physics lecture objectives.
13. Drawing conclusions between data and results including constructing graphs and identifying relationships between variables.

Prerequisites:

Satisfaction of the CSU system General Education Quantitative Reasoning Requirement (CSU-GE Area B4).

Your success is my main concern and it can be achieved by following this syllabus, attending the lab and class, asking questions, and completing the reading assignments. Learning is never easy, but I will do my best to make it as painless as possible. Your questions and class participation are important so that I can adjust my explanations to match your background and frame of mind.

Required Textbook

Physical Science, 11th Edition by Bill W. Tillery (McGraw-Hill), ISBN 978-0-07-786262-6.

Although this text is very expensive, you will be using it throughout this course and in your Earth Sciences course. It is also important to own a science textbook for reference after finishing college. Earlier editions are so similar, you should feel free to buy used earlier editions on-line if necessary.

The supplementary materials sold in association with this text may be helpful, but are NOT required.

Course Assignments

It is the responsibility of the students to attend the class well prepared. Each chapter of the text should be read as it is covered in the class and then reviewed before the corresponding quizzes and mid-term tests. Ask questions whenever you don't understand something. If what I say in class needs correcting or clarification, ask.

It is especially important to understand each example calculation, the definitions of special scientific words, and the metric units for physical quantities. At the end of each chapter is a "Summary of Equations" and "Key Terms" section. There will be an "Equation Sheet" provided at the start of the semester that contains very useful information. You will greatly benefit by learning how to use what is on it and are encouraged to write notes on that copy. During each quiz and test, a fresh, clean copy of it will be provided which you can use, but must not mark up.

College differs from High School in that you are largely on your own to learn – you sink or swim without being coddled. Instructors and textbooks provide the material and answer questions. Tests allow the instructor to certify whether or not the student has learned the material. The student, however, must exhibit the necessary discipline and study habits to take advantage of these resources.

In this course, simple inexpensive experiments will be stressed since the first step to learning science is by observing how nature works. The second step, applying the powerful tools of mathematics, comes later and will not be stressed in this course. You will, however, be expected to know how to use and rearrange the simplest equations of physics and chemistry. Most experiments will involve inexpensive materials obtainable from hardware stores and supermarkets. To be an effective K-6 teacher, you must have a large repertoire of inexpensive hands-on science experiments to maintain student interest and nurture scientific reasoning.

Evaluation Methods

Two midterm tests, eight 10-minute quizzes, and one final exam will be given. Also, an informal record of your lab activities must be maintained. Explanations of laboratory demonstrations will also be part of the material to be tested in the quizzes, mid-term tests and final. You will be expected to understand most of the experiments and demonstrations well enough to perform and explain them to others. Tests and quizzes are graded with partial credit being awarded. Points are accumulated through the course as follows:

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| Calculations Test | 100 | 8 Quizzes | 160 points |
| Midterm - Chapters 1-7 | 200 points | Lab Record | 200 points |
| Midterm - Chapters 8-13 | 200 points | Final Exam | 400 points |

The content of the final exam will be variations on the more advanced questions given in the midterm tests.

The lab journal will be a record of measurements, data graphs, and demo summaries. It will not need to be extremely detailed, but must be a sufficient description of what was done to be of future use when you become a teacher and/or parent. It can refer to relevant handouts or book sections, but should provide your observations, measurement results and graphs. During the lab activities, I will suggest suitable descriptive wording when requested. Although you will work in groups, separate journal notes need to be handed in at the end of lab.

Course letter grades will be given according to the following scale:

1260–1100: A 1099–920: B 919–750: C 749–580: D 579–0: F

Academic dishonesty is not tolerable.

Calculations

Quantitative results are crucial to physics and chemistry so you will need to be able to do calculations using scientific notation, logarithm, and powers of 10. You will need to demonstrate your proficiency at these calculations in a separate Calculation Test. Such calculations are usually done on separately purchased scientific calculators, but if your computer or phone has an application that can do these calculations, it will also be allowed **for the Calculation Test only**. Do-overs on the calculation test will be provided until it is mastered.

No cell phones or computer assistance will be allowed during all other testing. For those tests and quizzes, you will only be required to write the form of the also calculation, but not evaluate it. How to do this will be explained in class. You must, however, **always show the units that the numeric answer will have.**

Schedule

Lecture: Room AC1-106, Tuesdays & Thursdays 4:00 – 5:15 pm

Lab: Room AC2-238 Tuesday 5:30 - 8:20 pm

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| Tuesday | January 15 | Lecture – Chapter 1: What is Science Lab – 1. Measurement using metric units, density |
| Thursday | January 17 | Lecture – Appendix A: Working With Equations |
| Monday | January 21 | Martin Luther King, Jr. day – No Classes |
| Tuesday | January 22 | Lecture – Chapter 2: Motion Lab – 2. Gravity, free fall, and kinetic energy; pressure and fluids |
| Thursday | January 24 | Lecture – Chapter 2: Motion + Notes about Pressure & Fluid Flow |
| Tuesday | January 29 | Lecture – Chapter 3: Energy Lab start – Quiz 1 (Chapter 1 & Appendix A) Lab – 3. Energy conversion, electrolysis, H ₂ -O ₂ explosion, Pendulums |
| Thursday | January 31 | Lecture – Chapter 3: Energy |
| Tuesday | February 5 | Lecture – Chapter 4: Heat & Temperature Lab – 4. Levers, Balance, H ₂ O warming, Tacoma Narrows, Bernoulli |
| Thursday | February 7 | Lecture – Calculations Test (Redone until mastered) |
| Tuesday | February 12 | Lecture – Chapter 4: Heat & Temperature Lab start – Quiz 2 (Chapters 2 & 3 + Pressure & Fluid Flow) Lab – 5. Buoyancy; rope, slinky and sound waves |
| Thursday | February 14 | Lecture – Chapter 5: Wave Motions & Sound |
| Friday | February 15 | President Lincoln Day - No Classes |
| Monday | February 18 | President Washington Day – No Classes |
| Tuesday | February 19 | Lecture – Chapter 5: Wave Motions & Sound Lab – 6. Electrostatics, Circuits, and Multimeter use |
| Thursday | February 21 | Lecture – Chapter 6: Electricity |
| Tuesday | February 26 | Lecture – Chapter 6: Electricity Lab start – Quiz 3 (Chapters 4 & 5) Lab – 7. Electromagnetism, Levitation, Motors, and Transformers |
| Thursday | February 28 | Lecture – Chapter 6: Electricity |
| Tuesday | March 5 | Lecture – Chapter 7: Light Lab start – Quiz 4 (Chapters 6 & 7) Lab – 8. Refraction, Diffraction, Polarization, Optical instruments |
| Thursday | March 7 | Lecture – Review of Chapters 1-7 |
| Tuesday | March 12 | Lecture – More Review of Chapters 1-7 Lab – Test on Chapters 1-7 |
| Thursday | March 14 | Lecture – Chapter 8: Atoms and Periodic Properties |
| Tuesday | March 19 | Lecture – Chapter 8: Atoms & Periodic Properties |

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| Thursday | March 21 | Lab – 9. Molecular models: building fats, sugars, cellulose, and starch |
| Tuesday | March 26 | Lecture – Chapter 9: Chemical Bonds |
| | | Lab – 10. Build models of amino acids, oxytocin, proteins |
| Thursday | March 28 | Lecture – Chapter 10: Chemical Reactions |
| Tuesday | April 2 | Lecture – Chapter 11: Water and Solutions |
| | | Lab start – Quiz 5 (Chapter 8 & 9) |
| | | Lab – 11. Molecular models: nucleotides, and plastics |
| Thursday | April 4 | Lecture – Chapter 11: Water and Solutions |
| Tuesday | April 9 | Lecture – Chapter 11: Water and Solutions |
| | | Lab start – Quiz 6 (Chapters 10 & 11) |
| | | Lab – 12. Cabbage pH indicator, pH, Solubility and Electrochemistry |
| Thursday | April 11 | Lecture – Chapter 12: Organic Chemistry |
| Mon-Fri | April 15-19 | Spring Break |
| Tuesday | April 23 | Lecture – Chapter 12: Organic Chemistry |
| | | Lab – 13. Low temperatures and Making Liquid Nitrogen Ice Cream |
| Thursday | April 25 | Lecture – Chapter 12: Organic Chemistry |
| Tuesday | April 30 | Lecture – Chapter 13: Nuclear Reactions |
| | | Lab start – Quiz 7 (Chapters 12) |
| | | Lab – 14. Radioactivity, Our Friend the Atom |
| Thursday | May 2 | Lecture – Chapter 13: Nuclear Reactions |
| Tuesday | May 7 | Lecture – Chapter 13: Nuclear Reactions |
| | | Lab start – Quiz 8 (Chapters 13) |
| | | Lab – 15. Hiroshima, Fukushima, 3-Mile Island, and Chernobyl |
| Thursday | May 9 | Lecture – Review of Chapters 8-13 |
| Tuesday | May 14 | Lecture – More Review of Chapters 8-13 |
| | | Lab – Test on Chapters 8-13 |
| Thursday | May 16 | Lecture – Review of Physics for Final |
| Thursday | May 23 | Final Exam on entire course 4:00 – 6:00 pm |

Notes Available at <http://yosemitefoothills.com/Science-1A>

I will endeavor to put all handouts on my web site at <http://yosemitefoothills.com/Science-1A> since many of you may like that option. The default will be to pass out printed copies. Let me know if you would not use the printed copies and a few trees might be saved. My personal preference is to work with printed copies of information that I can mark up as I study them. I expect to be editing these pages until the week or two before we use them. So don't be eager to print them very far ahead of time.

E-mail Address for Instructor Craig Van Degrift

My e-mail address is: science1a@yosemitefoothills.com
but always also CC to: craig.vandegrift@sccd.edu

(Be sure to spell Yosemite correctly and don't forget the 's' at the end of foothills.
 That e-mail address is direct to me, but it is important to also CC to the sccd address.)

I have no office on campus and live quite far away, but will be able to arrive early and stay late to help students that would like additional help.

Important Dates

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| January 2 | W | Campus re-opens after Winter Break |
| January 11 | F | Last day to add a full-term Spring 2019 class in person or online through WebAdvisor 5:00 p.m. |
| January 14 | M | Start of Spring 2019 semester |
| January 21 | M | Martin Luther King, Jr. day observed (no classes held; campus is closed) |
| January 25 | F | Last day to drop a Spring 2019 full-term class for a full refund |
| February 1 | F | Last day to add a Spring 2019 full-term fall class in person with authorization code label |
| February 1 | F | Last day to drop a Spring 2019 full-term class to avoid a “W” in person |
| February 3 | SU | Last day to drop a Spring 2019 full-term class to avoid a “W” on WebAdvisor |
| February 3 | SU | Last day to add a Spring 2019 full-term class with an authorization code label on WebAdvisor |
| February 15 | F | Last day to change a Spring 2019 class to/from a Pass/No-Pass grading basis |
| February 15 | F | President Lincoln day observed (no classes held; campus is closed) |
| February 18 | M | President Washington day observed (no classes held; campus is closed) |
| March 15 | F | Last day to drop a Spring 2019 full-term class (letter grades assigned after this date) |
| April 15-18 | M-TH | Spring recess (no classes held; campus is open) |
| April 19 | F | Spring Holiday (no classes held; campus is closed; classes reconvene April 22) |
| May 20-24 | M-F | Spring 2019 final exams week |
| May 24 | F | End of Spring 2019 semester; Commencement Ceremony |

Disable Students Notice

If you have a verified need for an academic accommodation or materials in alternate media (i.e. Braille, large print, electronic test, etc.) per the American With Disabilities Act or Section 504 of the Rehabilitation Act please contact your me as soon as possible.