

Chem/Phys 105, University of San Diego, Fall 2009

Physical Sciences for K-8 Teachers

Instructor Information:

Eric Page

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Jeremy Kua

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- Class web site: <http://home.sandiego.edu/~jkua/chem105/>
- Office Hours: Mon & Wed: 11:30am-12:30pm; Tue: 2:30-4pm; Thu: 10:30am-noon

Class Meetings: Mondays and Wednesdays, 2:30 – 4:30 pm in ST 252 (Phys)/ 494 (Chem)

Text/Notebook (required): Student Lab Notebook, 100 Carbonless Duplicate Sets, *Hayden McNeil Specialty Products* (ISBN: 1-930882-00-9)

Course Description/Objectives: This course is a laboratory/lecture/discussion class intended to teach some basic principles in Physics and Chemistry, the process of scientific inquiry, the value of hands-on learning, and the importance of group discussion in developing an understanding of complex phenomena. After completing this course, the student should have developed sufficient knowledge and laboratory skill to prepare, understand, and explain her/his own demonstrations and experiments for elementary and middle school science classes. The topics in this course have been selected based upon the *Science Content Standards for California Public Schools (K-8)* and the Content Specifications in Science for Multiple Subject Teachers – please see specifications attached to the end of this syllabus. This course is not intended to teach the student everything she/he may need to know in Physical Science, but should stimulate the desire for independent learning in the subject. Emphasis will be placed on interactive, hands-on group learning, and every effort will be made to perform experiments using everyday materials.

Schedule: The class will be divided into two groups, I and II. As shown on the detailed schedule on page 2 of this syllabus, Group A will start with chemistry and then after the midterm exam, will switch to physics. Group B will start with physics and then end with chemistry.

Grades: Grades will be based upon the following scheme with +/- added where appropriate.

	<u>Points</u>	<u>Grading Scale</u>
Physics Coursework	150	A = 85 – 100%
Physics Exam	100	B = 70 – 84%
Chemistry Coursework	150	C = 55 – 69%
Chemistry Exam	<u>100</u>	D = 40 – 54%
	500	F = less than 40%

Exams and quizzes will be closed-book, closed-notes, unless otherwise specified. Your instructor will give you specific guidelines for graded coursework work at the 1st class meeting.

Attendance: This is a laboratory-based class, so it is imperative that you attend class regularly.

Academic Integrity: Please read USD's Academic Integrity Policy. No violations of this policy will be tolerated, and may result in a failing grade. All work turned in for credit must be your own.

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Detailed Class Schedule

Date	Group I	Group II
Wed, Sept 2	Orientation, safety, and goals	Orientation, safety, and goals
Wed, Sept 9	Science & Discovery	Graphical Analysis
Mon, Sept 14	Mixture Separations	Gravity, Mass & Weight
Wed, Sept 16	The Scientific Method	Conservation of Matter
Mon, Sept 21	Mass, Volume & Density	Non-Uniform Motion
Wed, Sept 23	The Atom	Inclined Planes, Force, & Work
Mon, Sept 28	Atomic Spectroscopy	Inter-conversion of Energy
Wed, Sept 30	The Periodic Table	Heat and Temperature
Mon, Oct 5	Chemical Bonding I	Sound
Wed, Oct 7	Chemical Bonding II	Electricity
Mon, Oct 12	Acid and Bases and pH	Magnetism
Wed, Oct 14	Chemical Reactions I	Light & Color
Mon, Oct 19	Chemical Reactions II	Light Paths
Wed, Oct 21	Forensic Chemistry Murder Mystery	Refraction of Light
Mon, Oct 26	Chemistry exam (1.25 hr) Orientation to Physics	Physics exam (1.25 hr) Orientation to Chemistry
Wed, Oct 28	Graphical Analysis	Science and Discovery
Mon, Nov 2	Gravity, Mass & Weight	Mixture Separations
Wed, Nov 4	Conservation of Matter	The Scientific Method
Mon, Nov 9	Non-Uniform Motion	Mass, Volume & Density
Wed, Nov 11	Inclined Planes, Force, & Work	The Atom
Mon, Nov 16	Inter-conversion of Energy	Atomic Spectroscopy
Wed, Nov 18	Heat and Temperature	The Periodic Table
Mon, Nov 23	Sound	Chemical Bonding I
Wed, Nov 25	NO CLASS (Thanksgiving Break)	NO CLASS (Thanksgiving Break)
Mon, Nov 30	Electricity	Chemical Bonding II
Wed, Dec 2	Magnetism	Acid and Bases and pH
Mon, Dec 7	Light & Color	Chemical Reactions I
Wed, Dec 9	Light Paths	Chemical Reactions II
Mon, Dec 14	Refraction of Light	Forensic Chemistry Murder Mystery
Mon, Dec 21	Physics Exam (1.25 hr)	Chemistry Exam (1.25 hr)

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Chemistry & Physics Content Specifications for the Multiple Subject Teaching Credential

Part I: Content Domains for Subject Matter Understanding and Skill in Science

1.1	Structure and Properties of Matter (covered in the Chemistry portion of the course)
1.1.1	Understand the physical properties of solids, liquids, and gases, such as color, mass, density, hardness, and electrical and thermal conductivity.
1.1.2	Know that matter can undergo physical changes (e.g., changes in state such as the evaporation and freezing of water) and chemical changes (i.e., atoms in reactants rearrange to form products with new physical and chemical properties).
1.1.3	Know that matter consists of atoms and molecules in various arrangements, and can give the location and motions of the parts of an atom (protons, neutrons, and electrons).
1.1.4	Describe the constituents of molecules and compounds, naming common elements (e.g., hydrogen, oxygen, and iron), and explain how elements are organized on the Periodic Table on the basis of their atomic and chemical properties.
1.1.5	Describe characteristics of solutions (such as acidic, basic, and neutral solutions) and they know examples with different pH levels such as soft drinks, liquid detergents, and water.
1.1.6	Know that mixtures may often be separated based on physical or chemical properties
1.2	Principles of Motion and Energy (covered in the Physics portion of the course)
1.2.1	Describe an object's motion based on position, displacement, speed, velocity, and acceleration.
1.2.2	Know that forces (pushes and pulls), such as gravity, magnetism, and friction act on objects and may change their motion if these forces are not in balance.
1.2.3	Know that "like" electrical charges or magnetic poles produce repulsive forces and "unlike" charges or poles produce attractive forces.
1.2.4	Describe simple machines in which small forces are exerted over long distances to accomplish difficult tasks (e.g., using levers or pulleys to move or lift heavy objects).
1.2.5	Identify forms of energy including solar, chemical, electrical, magnetic, nuclear, sound, light, and electromagnetic.
1.2.6	Know that total energy in a system is conserved but may be changed from one form to another, as in an electrical motor or generator.
1.2.7	Understand the difference between heat, (thermal energy) and temperature, and understand temperature measurement systems.
1.2.8	Know how heat may be transferred by conduction, convection, and radiation (e.g., involving a stove, the Earth's mantle, or the sun).
1.2.9	Describe sources of light including the sun, light bulbs, or excited atoms (e.g., neon in neon lights) and interactions of light with matter (e.g., vision and photosynthesis).
1.2.10	Know and can apply the optical properties of waves, especially light and sound, including reflection (e.g., by a mirror) or refraction (e.g., bending light through a prism).
1.2.11	Explain conservation of energy resources in terms of renewable and non-renewable natural resources and their use in society.

Adapted from http://www.cset.nesinc.com/CS_SMR_opener.asp

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Part II: Subject Matter Skills and Abilities

Applicable to the Content Domains in Science

All of these will be covered in both the
Physics and Chemistry portions of the course.

1	Know how to plan and conduct a scientific investigation to test a hypothesis.
2	Apply principles of experimental design, including formulation of testable questions and hypotheses, and evaluation of the accuracy and reproducibility of data.
3	Distinguish between dependent and independent variables and controlled parameters, and between linear and nonlinear relationships on a graph of data.
4	Use scientific vocabulary appropriately (e.g., observation, organization, experimentation, inference, prediction, evidence, opinion, hypothesis, theory, and law).
5	Select and use a variety of scientific tools (e.g., microscopes) and know how to record length, mass, and volume measurements using the metric system.
6	Interpret results of experiments and interpret events by sequence and time (e.g., relative age of rocks, phases of the moon) from evidence of natural phenomena.
7	Communicate the steps in an investigation, record data, and interpret and analyze numerical and non-numerical results using charts, maps, tables, models, graphs, and labeled diagrams.
8	Make appropriate use of print and electronic resources, including the World Wide Web, in preparing for an investigative activity.
9	Communicate the steps and results of a scientific investigation in both verbal and written formats.

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Chemistry 105 – Dr. Kua

The 250 pts allotted to the Chemistry portion of the course will be graded as follows:

Exam (100 points)

There will be one comprehensive final exam at the end of the chemistry coursework.

Quizzes (8 x 5 pts = 40 points)

We will have between 9-13 quizzes that will take place during the first 10 minutes of class.

Your top 8 scores will be counted towards your grade. There will be no makeup quizzes.

Quizzes will **include material from the previous class and preparation for the class that day.**

Please be sure to arrive to class *on time* to allow yourself the full 10 minutes to take your quiz.

Reports (2 x 15 pts = 30 points)

There will be two reports due. The purpose of the reports is to reflect on experiments that we performed that might inspire you as a K-8 teacher. The report form is posted in WebCT under the "Reports" section for you to download, and the form contains clear guidelines for report content and format. Reports should be approximately 3-5 pages in length. Reports will be due at the beginning of class on the due date. Late reports will be docked 50% for the first 24 hours after the due time, 75% for the next 24 hours, and no credit beyond.

Lab Notebook Checks (3 x 15 pts = 45 points)

At the end of class on four days during the course, lab notebooks will be collected and graded. Your notebook should be kept up to date, correctly formatted and include all relevant course materials. All notes and coursework should be written in your lab notebook. Handouts and printouts (excluding the syllabus, course schedule etc) must be taped or stapled into your lab notebook according to the date they were passed out. The first two pages of your lab notebook should be reserved for a Table of Contents. The first notebook check will be not be graded but will serve to guide you in understanding expectations. Late notebooks will be docked 50% for the first 24 hours after the due time, 75% for the next 24 hours, and no credit beyond.

Pre and Post Lab Assignments (25 points)

You will be expected to prepare for each lab in advance and consider the results of your experiment after performing the lab. Pre and post lab activities may include reading assignments, questions to answer, websites to visit, etc. Some assignments will be graded while others will not. The point values assigned to graded work may vary. The pre and post lab work will often reappear on quizzes so it is vital that you stay up to date. Late pre or post lab work will receive no credit. The due date for each assignment will be clearly printed at the top of the first page. You will be able to find your assignments on the class web site on my home page. While you may work in groups to discuss and consider your pre and post lab work, your written answers must be your own.

Safety & Participation (10 pts)

In a chemistry lab, safety is paramount. We will discuss in detail the safety guidelines for our lab and the chemicals we will be working with. Your attention to safety throughout the semester will be considered. Be responsible for your personal safety by always wearing the appropriate footwear, tying back long hair, wearing safety glasses when instructed and disposing of chemicals in the correct manner. *Be the student you want to see you in your future classroom. Get involved, ask questions and participate in activities!*

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Physics 105 – Dr. Page

The 250 pts allotted to the Physics coursework portion of the course will be graded as follows:

Exam (100 points)

There will be one comprehensive final exam at the end of the physics coursework.

Quizzes (8 x 5 pts = 40 points)

We will have 8 quizzes for Physics that will take place during the first 10 minutes of class. Quizzes will cover new material since the last quiz **to include preparation for the experiment we'll be doing that day**. Please be sure to arrive to class *on time* to allow yourself the full 10 minutes to take your quiz.

Curriculum Reports (2 x 12.5 pts = 25 points)

There will be two curriculum reports due this semester. The purpose of the reports is to reflect on experiments that we performed that might inspire you as a K-8 teacher. The report form is posted in WebCT under the "Reports" section for you to download, and the form contains clear guidelines for report content and format.

Society Reports (2 x 12.5 pts = 25 points)

One of my main goals in the physics part of this course is to assist all of you in discovering the many ways in which science touches society and your life. To facilitate this, each of you will do two reports based on magazine articles of interest to you. More information will be provided during the course.

Lab Notebook Checks (2 x 12.5 pts = 25 points)

At the end of class on three days during the course, lab notebooks will be collected and graded. Your notebook should be kept up to date, correctly formatted and include all relevant course materials. All notes and coursework should be written in your lab notebook. Handouts and printouts must be taped or stapled into your lab notebook according to the date they were passed out. The first two pages of your lab notebook should be reserved for a Table of Contents. The first notebook check will not be graded but will serve to guide you in understanding expectations.

Pre and Post Lab Assignments (25 points)

You will be expected to prepare for each lab in advance and consider the results of your experiment after performing the lab. Pre and post lab activities may include reading assignments, questions to answer, websites to visit etc. Some assignments will be graded while others will not. The point values assigned to graded work may vary. The pre and post lab work will often reappear on quizzes so it is vital that you stay up to date. **No late pre or post lab work will be accepted.** The due date for each assignment will be clearly printed at the top of the first page. You will be able to find your assignments in the corresponding experiment folder on WebCT. While you may work in groups to discuss and consider your pre & post lab work, your written answers must be your own.

Participation (10 pts)

Science, both in the classroom as well as in the lab or field, is almost always a collaborative effort. We often learn more from our peers than we do from a textbook or even (and yes, it pains me to say this) the instructor. In this light, participation in the physics part of the course is vital and will count towards your overall grade.

Physics Notes:

- Course material handed in late may lose a considerable number of points
- If my door is open, please feel free to stop by, even if it's not my office hours.