PS121 – Physical Science for Teachers: Chemistry

Fall 2015

Time:	Tuesday / Thursday 2:00 PM – 3:50 PM; S179
Instructor:	Dr. Yeliz Celik
Office:	S255
E-mail:	celik@marshall.edu
Office Hours:	M, 11:00 pm – 12:00 AM; W, 9:00 am – 12:00 PM; F, 9:00 AM-12:00 PM
Required Text:	Physical Science for Teachers: Chemistry (Pearson Custom Text)
Final Exam:	Tuesday, Dec. 10th, 12:45 pm – 2:45 pm

Catalog Description: PS121 is part of a 3 course sequence of Physical Science for K-9 Education majors. Includes 2-hr, 1 credit lab. *(3 hours)*

Fuller Course Description: PS121 is a survey of introductory chemistry, particularly focused on content related to the Next Generation Science Standards (NGSS). It is designed to provide the chemistry background (atomic structure, properties of matter, phase changes, chemical reactions, heating & cooling) required for K-9 Education majors, as well as provide practice in the applied engineering principles included in these new standards. This course will model the type of inquiry-based, interactive learning environment expected of teachers by the NGSS. Lectures will be brief and interspersed with lab activities and investigations designed to foster higher-order learning and enhance critical thinking skills.

Grading:

Homework	10%	A	90-100
Tests (3)	45%	B	80-89
Investigations	15%	C	70-79
Journal	10%	D	60-69
Final Exam	20%	F	0-59

Homework: Homework will be conducted using the textbook publisher's online system, *MasteringChemistry*. An access code has been bundled with the textbook. Please take note of the course ID# the first day of class.

A Note on Homework: Please do the homework. Please allow enough time on the homework so that you can think about your responses and pay close attention to the questions. It is not intended to be mere busy work but is instead an important part of the learning experience.

Investigations: At least half the class will be devoted to hands-on, laboratory-style investigations; design or testing problems; and lecture tutorials. Many of these will be "open-ended" problems. The exact design and procedure of the investigation will be up to you. This is in keeping with both the letter and spirit of the NGSS, so you will have a chance in this course to practice what you will teach.

Journals: All of your experimental work on the investigations will be kept in your science journal, as well as your conclusions on the results. In addition you will be asked periodically to reflect on the assignments and comment on your learning process. Journals will be kept in the classroom at all times. Although I will periodically review your journals and offer feedback, you are encouraged to discuss your writing with me at any time.

Exams: A total of four (3) exams covering each unit will be conducted throughout the semester.

Material from the investigations **WILL** be included on the exams.

Final Exam: The final exam **WILL** be cumulative.

University Policies: By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy by going to http://www.marshall.edu/academic-affairs/policies.

Academic Dishonesty/ Excused Absence Policy for Undergraduates/ Computing Services Acceptable Use/ Inclement Weather/ Dead Week/ Students with Disabilities/ Academic Forgiveness/ Academic Probation and Suspension/ Academic Rights and Responsibilities of Students/ Affirmative Action/ Sexual Harassment

Attendance Policy: Regularly attending class is crucial to your success, as many of the class activities are interactive. Being on time for class and attending all class meetings is expected.

Excused Absences - Students who miss interactive activities with an excused absence will be provided with an alternative assignment that connects to the activities in the missed class session. An excused absence generally requires a written excuse from another source (Physician, etc.).

Unexcused Absences –

- If you must miss a class, contact your instructor immediately.
- If you miss two classes, expect an email/notification from your instructor.
- Subsequent missed classes will result in a letter grade deduction.

Other Course Policies:

- Any work handed in late will suffer a 10% penalty per **calendar** day. This does not apply for any day for which there is an excused absence.
- Makeup work will **NOT** be allowed except for *documented* emergencies.
- If you must miss a class, contact your instructor immediately. Even for an excused absence, if you wait too long to discuss a makeup with your instructor you may be denied to opportunity for a makeup.
- ***Be sure to let your instructor know at least a week ahead of time if a university activity will require an absence from class.***
- Cell phone use is not permitted in the classroom. Please turn cell phones to OFF or vibrate while in class.
- Except for calculators, *all other electronic devices must be turned off in class*. Laptops, tablets, etc.
- Any act of academic dishonesty of any kind will result in a final grade of F for the class.
- The instructor reserves the right to allow exceptions to these policies without incurring any obligation to allow an exception in any particular situation.

Course Schedule: (*Subject to change!*) Tests will be conducted at the end of Units 1-3. Unit 4 will be assessed on the final exam.

Unit	Week(s)	Topics Covered

1	1-4	Physical & Chemical Properties/Changes; Heat & Thermal Energy; Changes of State
2	5-8	Atoms & Radioactivity; The Periodic Table; Elements & Compounds; Solutions; Chemical Formulas & Names
3	9-12	Chemical Bonding; Chemical Reactions; Chemical Equations; Oxidation & Reduction; Acids & Bases
4	13-14	Hydrocarbons; Organic Molecules; Biochemistry

Learning Outcomes:

Practice: Homework & Investigations

Assessment: Unit Exams & Final Exam

Outcomes:

- Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.
- Develop a model to describe that matter is made of particles too small to be seen. Develop models to describe the atomic composition of simple molecules and extended structures.
- Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.
- Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.
- Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.
- Conduct an investigation to determine whether the mixing of two or more substances results in new substances.
- Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.
- Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.
- Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.
- Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.
- Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.
- Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.

- Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

- Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

- Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

- Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

- Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

- Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.