PS.121 §201– Physical Science for Teachers: Chemistry
2021 Spring **(CRN 4433)**

Class meets:	Tuesdays & Thursdays @ 9:00 – 10:50 , in Sci.179 or remote linking to 179
Instructor:	Dr. Curt Foltz Sci.159 email: foltzc@marshall.edu phone: (304) 696-2519
Office Hours:	M_W_F 9:30–11:30 & _T_R_ 11:30–12:30 & MTWR_ 13:30–15:30 (=1:30-3:30pm)
Web-site:	www.science.marshall.edu/foltzc/121_21sp.htm
Required Text:	Physical Science for Teachers: Chemistry Workbook (Pearson Custom Text)

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)*

Verbose Description: PS121 is a survey of introductory chemistry, focused on content required by 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) that NGSS expects K-9 education majors to teach, and to provide experience in the engineering practice sequences that these standards include. This course will try to model an inquiry-based, interactive learning environment that NGSS expects grade-school teachers to implement. Lectures will be brief and interspersed with lab activities, to foster higher-order learning & enhance critical thinking skills.

Course Components:

Homeworks	Investigations	Quizzes	Exams Feb18,Mar.25,Apr.27
(9) 12½%	(24) 12½%	(9) 25%	(3) 50%

Letter Grades: 100% > A > 90% > B > 80% > C > 70% > D > 60% > F > 0%

Homework: purchase an access code for on-line HW at *http://www.masteringchemistry.com*
this section's course name is MC121foltz21 , the course ID is foltz54402 .

Investigations: About half the class will be devoted to hands-on, laboratory-style investigations; design or testing problems; and lecture tutorials or demonstrations. Some labs will be "open-ended" scenarios (their exact design and procedure 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 your experimental work will be written in a science journal, with a discussion of your results, and any conclusions that pertain to theory. You may want to include relevant homework examples, and written reflections about the course. Journal entries are the evidence (artifact) that you did the investigations – journals may be looked at (and commented on) just after a Quiz or Exam.

Quizzes: 3 Quizzes will be given during each Unit, as practice for the Exams.

Exams: Three (3) Unit Exams, each covering about the same amount of material, will be conducted throughout the semester. Questions about the investigations **WILL** be included on the exams. Unit 3 Exam will be given during Finals week, directly before a cumulative post-instruction assessment.

Homeworks: Please apply effort to the homework sets. The science goal is not to find the correct answer to a few homework questions – rather, it is to see *how to figure out* how to answer some types of questions. If you consider the questions from several perspectives, then you can categorize them by the aspects of nature that are being asked about. This is what we mean by understanding. The course does not intend to reward busy-work, regurgitated definitions, nor memorization. Students who do the homework themselves (not copying someone else's effort) will understand more. I intend that those who understand more, end up with higher grades. Homeworks are formative assessments, so you should co-labor on them with a classmate study-partner to *help each other* learn.

Quizzes and Exams: These are summative assessments, so they are to be done solo, closed-book and closed-notes (but with Periodic Table & ion name sheet, when appropriate). Remote Quizzes and Exams will be taken with a detachable (USB) web-cam set to show your work-space to the proctor *via Teams* or *Zoom* or *BlackBoard*. Remote Quizzes and Exams will be emailed as a pdf-file, which you may print and write answers on, or merely display on screen to answer on notebook paper.
When finished, you will photograph or scan each page, and email them to me as a jpg, pdf, or png file.

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

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

Attendance Policy: Regular attendance is crucial to this course success, as many class activities are interactive. Being on time for class and attending all class meetings is expected. Period. Excessive absences – whether excused or unexcused – will affect your ability to earn a passing grade. Students who miss (do not attend) 4 classes (≈15% of our 28 classes) should not expect an "A" letter grade. Remote students should be trying to answer questions posed to the class, as if they were in the room.

Missed Quiz – Students who miss a Quiz or Exam should email me (foltzc@marshall), as soon as is feasible, to schedule a make-up opportunity. These make-ups will occur outside regular class time, preferably before the next regular class meeting occurs. Make-ups are opportunities provided to you by the grace of the university (for excused absences) or the instructor (for unexcused absences) …

Late Homework – Homework will typically be due before that Topic Quiz. Homework attempts after the due date (and time) will usually be penalized 25% until the next Exam, and 50% after that Exam.

Other Course Policies:

- ¤Cell phone use is usually not permitted in the classroom. Turn cell phones to OFF or vibrate.
- ¤Students in class may use a calculator & a tablet *connecting to an enrolled remote lab partner*.
- ¤Any act of academic dishonesty may result in: (at minimum) a score of 0 for that assignment, or (at maximum) a final letter-grade of **F** for the course.
- ¤The instructor reserves the right to allow an exception(s) to any course policy without incurring any obligation to allow an exception to that policy in any other particular situation.

.

Course Schedule: (*Approximate and Tentative!*) Plan for an Exam after each unit.

Weeks	Unit	Topics
1-4	1	Properties; States of Matter; Heat, Energy, and Temperature; Change of State
5-9	2	Atomic structure; Elements & their properties; Chemical Formulas & Names
10-14	3	Chemical Reactions; Balancing Equations; Red-Ox; Acids & Bases; Organics

Learning Outcomes: *Practiced on* Homeworks & Investigations *Assessed on* Quizzes & Exams

¤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.