

Instructor: Dr. Jennifer Mihalick

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office hours: M-F 8:00-9:00 am, or by appointment

home page: http://www.uwosh.edu/faculty_staff/mihalick/

course web site: http://www.uwosh.edu/faculty_staff/mihalick/materials/materials.html

Required course manuals (available at University Books and More):

Introduction to the Chemistry of Materials and *Laboratory Manual for Chemistry 104*

Supplies required for laboratory:

safety goggles with indirect vents (available from the Chem Club); calculator.

Course Overview: This laboratory course will teach the chemistry behind materials that society depends on: metals, polymers, and ceramics. Materials chemistry is an active area of scientific research and one with many practical applications. In addition to exploring the relationship of chemical composition and structure to properties and performance, the historic and economic impacts of materials manufacture and use will be considered. This course fulfills a natural science requirement for the University's liberal education program, providing knowledge of human cultures and the physical and natural world, and also developing skills in the areas of quantitative literacy, written and oral communication, teamwork, and problem solving. It is not intended for students pursuing chemistry, biology, or health-related majors.

List of Topics

Classification of Matter: historic eras, metric system, physical & chemical properties,
atomic structure, periodic table

Structure of Solids: crystalline, amorphous

Metals: metallic and ionic bonds, oxidation-reduction reactions, alloys, magnets

Polymers: covalent bonds, natural & synthetic fibers, paper, polymerization reactions

Dyes: light & color, interactions with fibers

Ceramics: pottery, heat and reactions, glass, concrete

Semiconductors

Advanced Materials

Course Components

Lecture: Major concepts will be introduced and discussed in lecture. We will observe samples of materials, view videos of materials processing, analyze laboratory results, and discuss news articles during the lecture periods.

Homework: Outside of class students will read the textbook, review lecture notes, look at websites, and do homework problems. Answers to homework problems will not be collected, but quizzes will check your understanding of the assignments. Although assignments will be distributed weekly, it is best to devote time each day to studying for the course. Studying with classmates may be helpful. Visit the instructor during office hours if you have questions about an assignment.

Each student will also write three short papers during the semester, based on primary references recommended by the instructor. Paper 1 will be related to metals; paper 2 will be on the economic impact of polymers; paper 3 will be on an advanced material.

Laboratory: All students must participate in laboratory on Thursdays, 1:20-3:30, in HS 401. The experiments in *Laboratory Manual for Chemistry 104* are closely connected to the lecture material. The experiment must be read before the lab period begins. The pre-lab assignment for each experiment will be checked at the beginning of the period. At the conclusion of each lab period you will leave your lab manual to be graded. Most students will earn 10 points for each experiment. Points will be deducted if the pre-lab assignment is not done; an experiment is not finished; notes are not complete; or safety rules are not followed. Graded lab manuals will be returned in lecture.

Doing laboratory experiments is an important part of the course. There are no make ups for a missed laboratory. If you miss a laboratory or leave before the experiment is complete you must submit a written excuse to the instructor. According to department policy, a student who misses more than one lab without an excuse fails the course.

Grading: Quizzes will be given almost every Friday. Three 100 point exams will also be given in lecture. They will have questions on material covered in lecture, laboratory, and homework.

Lab work	(13x10)	130
Quizzes	(11x10)	110
Papers	(10 + 2x20)	50
Presentation		10
<u>Exams</u>	(3x100)	<u>300</u>
TOTAL		600

Final grades will be based on the total points accumulated. Expected grade ranges are

100 - 87% A 86 - 75 B 74 - 63 C 62 - 50 D < 50 F

The instructor reserves the right to lower the cutoffs.

Q = quiz

week of	Monday	Wednesday	lab (Thurs)	Friday
1/31	1. Classification of Matter	1. Classification of Matter	Physical Properties of Materials	1. Classification of Matter Q
2/7	2. Structure of Solids	2. Structure of Solids	Properties of Crystals	2. Structure of Solids Q
2/14	3. Metals	3. Metals	Modification of Metal Properties	3. Metals Q
2/21	4. Alloys Paper 1 due	4. Alloys	Heat Capacities of Materials	4. Alloys Q
2/28	review	Exam 1	Fiber Identification by Physical & Chemical Properties	5. Structure of Polymers
3/7	5. Structure of Polymers	5. Structure of Polymers	Polymers from Monomers I	5. Structure of Polymers Q
3/14	6. Polymerization Reactions	6. Polymerization Reactions	Polymers from Monomers II: Polyester Synthesis	6. Polymerization Reactions Q
3/28	7. Applications of Polymers	7. Applications of Polymers Paper 2 due	Separation of Dyes by Paper Chromatography	7. Applications of Polymers Q
4/4	8. Dyes & Paints	8. Dyes & Paints	Preparation of Pigment and Paints	review Q
4/11	Exam 2	9. Pottery	Identification of Metal Ions in Ceramics	9. Pottery
4/18	10. Glass	10. Glass	Preparation and Modification of Glass	10. Glass Q
4/25	11. Construction Materials	11. Construction Materials	Preparation of Concrete	12. Semiconductors Q
5/2	12. Semiconductors	12. Semiconductors Paper 3 due	Concrete, check out	13. Advanced Materials Q
5/9	13. Advanced Materials	review	Presentations of Papers	Exam 3