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Fall 9-1-2001

### SCI 225.01: General Physical and Chemical Science

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## Science 225 GENERAL PHYSICAL AND CHEMICAL SCIENCE Autumn, 2001

**INSTRUCTORS:** Diane Friend, Office - SC 129 Phone: 243-4299 E-mail: dsfriend@selway.umt.edu  
David Freeman, Office - SB 308 Phone: 243-4772 E-mail: dfreeman@selway.umt.edu

**TEACHING ASSISTANTS:** Brian Boer, Office - SC 317, E-mail: boerbrian@hotmail.com  
Matthew Fitzpatrick, Office – JRH M4, E-mail: fitzpatrick0710@msn.com  
Deborah McArthur, Office – JRH M4, E-mail: muddebz@yahoo.com

**INTERNET SITE:** [www.physics.umt.edu/sci225](http://www.physics.umt.edu/sci225)

**LECTURES:** 3 one hour lectures/week, MWF at NOON, SC 131

**DISCUSSION/LABORATORY PERIODS:** 2 two hour sessions/week, Tu,W in SC 13, Th,F in SC 225

**MAIN REFERENCE:** CONCEPTUAL PHYSICAL SCIENCE by Hewitt, Suchocki and Hewitt

**GRADING:** EXAMS: Exams 1, 2, and 3 (15% each) . . . . . 45%  
FINAL EXAM: Friday, Dec. 21st, 8:00 am . . . . . 20%  
LAB NOTEBOOK: . . . . . 15%  
PROJECT PRESENTATIONS: . . . . . 10%  
WEEKLY ASSIGNMENTS . . . . . 10%

### **COURSE OUTLINE AND SCHEDULE:**

Week 1: Sept. 4 - Sept. 7 (Monday, Sept. 3 - **HOLIDAY**, Labor Day)

LECTURES: Overview: Matter and Energy  
DISCUSSION: Introductions, course policies  
LAB: Lab 1: Math and Graph Review  
READING: Prologue (pages 1-10), Appendix A (pages 748 -750), Chapter 15 (pages 362-376)

Week 2: Sept. 10 - 14

LECTURES: Motion, forces, and mechanical energy  
DISCUSSION: Discussion on the scientific process; collecting and presenting data  
LAB: Lab 2: Measurements and Determining Density Changes in Solids and Liquids  
READING: Chapter 1 (pages 12-26), Chapter 2 (pages 30-48), Chapter 3 (pages 60-71)

Week 3: Sept. 17 - 21

LECTURES: Gravity and gravitational energy  
DISCUSSION: Demonstrations and problems concerning forces and motion  
LAB: Lab 3: Determination of Gravitational Acceleration  
READING: Chapter 4 (pages 76-94)

Week 4: Sept. 24 - 28 (Friday, Sept. 28 - **EXAM 1**)

LECTURES: Electricity, magnetism, and electromagnetic energy  
DISCUSSION: Practice exam and electricity/magnetism demonstrations  
LAB: Lab 4: Electric Circuits - Using Light Bulbs as Resistors  
READING: Chapter 8 (pages 184-205), Chapter 9 (pages 211-225)

Week 5: Oct. 1 - 5

LECTURES: Light, the electromagnetic spectrum, and other wave energy  
DISCUSSION: Demonstrations and applications of waves  
LAB: Lab 5: Lenses and Image Formation  
READING: Chapter 10 (pages 232-249), Chapter 11 (pages 258-281), Chapter 12 (pages 285-307)

Week 6: Oct. 8 - 12

LECTURES: Thermodynamics, thermal energy and heat  
DISCUSSION: Optics and energy conversion problems  
LAB: Lab 6: Heat Measurements and Studying the Heat Capacities of Solids: Calorimetry  
READING: Chapter 6 (pages 134-155), Chapter 7 (pages 159-178)

Week 7: Oct. 15 - 19

LECTURES: Atomic structure and radioactivity  
DISCUSSION: Lab 7: Radioactivity Simulation and Measuring Half-Life  
LAB: **FIRST STUDENT PROJECT PRESENTATIONS**  
READING: Chapter 13 (pages 314-328) and Chapter 14 (pages 332-345)

Week 8: Oct. 22 - 26 (Friday, Oct. 26 - **EXAM 2**)

LECTURES: The elements and the Periodic Table  
DISCUSSION: Practice exam  
LAB: Lab 8: Atomic Spectra  
READING: Chapter 16 (pages 380-400)

Week 9: Oct. 29 – Nov. 2

LECTURES: Chemical bonds and building molecules  
DISCUSSION: Chemical compounds and structure of molecules  
LAB: Lab 9: Acid-base Chemical Reactions and Antacids  
READING: Chapter 17 (pages 404-420) and Chapter 20 (pages 472-480)

Week 10: Nov. 5 - 9 (Monday, Nov. 12 - **HOLIDAY**, Veteran's Day)

LECTURES: Molecular interactions and mixing; chemical reactions  
DISCUSSION: Molecular interactions and chemical equations practice exercises  
LAB: Lab 10: Separation and Purification of Substances by Chromatography  
READING: Chapter 18 (pages 424-435, 440-445) and Chapter 19 (pages 449-452)

Week 11: Nov. 12 - 16 (Friday, Nov. 16 - **EXAM 3**)

LECTURES: Chemical reactions and energy  
DISCUSSION: Practice Exam  
LAB: Lab 11: Introduction to Chemical Reactions  
READING: Chapter 19 (pages 452-456, 463-466) and Chapter 20 (pages 486-487, 494-496)

Week 12: Nov. 19 (Nov. 21 - 23, **THANKSGIVING HOLIDAY**)

LECTURES: Overview of the solar system  
DISCUSSION: **NO** sessions this week  
LAB: **NO** sessions this week  
READING: Chapter 28 (pages 684-690)

Week 13: Nov. 26 – 30

LECTURES: The solar system  
DISCUSSION: Planetarium; Lab 12, Part I: Exploring the Night Sky  
LAB: Lab 12, Part II: Making Models of the Solar System: Comparative Planetology  
READING: Chapter 28 (pages 691-703)

Week 14: Dec. 3 - 7

LECTURES: Nature and evolution of the stars  
DISCUSSION: Star charts; Star Probe  
LAB: Lab 13: The Relationship Between Brightness and Distance  
READING: Chapter 29 (pages 706-722)

Week 15: Dec. 10 - 14

LECTURES: Evolution of the Universe  
DISCUSSION: **SECOND STUDENT PROJECT PRESENTATIONS**

LAB: Final practice exam and review  
READING: Chapter 30 (pages 724-744)

**FINAL EXAM:** Friday, Dec. 21st, 8:00 a.m. – 10:00 a.m.

Instructors' Offices and Office Hours:

e-mail address:

**Diane Friend** (SC 129),  
Mon. 9-10, Tues. noon-1, Wed. 4-5, Thurs. 3-4, Fri. 1-2

dsfriend@selway.umt.edu

**David Freeman** (PhP 235),  
to be announced . . .

dfreeman@selway.umt.edu

**Brian Boer** (SC 317),  
Tues. noon-1, Wed. 9-10

boerbrian@hotmail.com

**Matthew Fitzpatrick** (JRH M4),  
Mon. 1:30-2:30, Wed. 8-9

fitzpatrick0710@msn.com

**Deborah McArthur** (JRH M4),  
Mon. 1-2, Wed. 11-noon

muddebz@yahoo.com

**Course Policies:**

1. Exams must be taken at the scheduled times unless a make-up time is arranged **BEFORE** the exam.
2. Homework assignments are due at the date and time specified. Late assignments will not be graded.
3. Lab notebooks will be collected and graded at periodic intervals throughout the semester (probably about four times). Your T.A. will give you at least one weeks notice before each collection date. Late notebooks will not be graded.
4. The presentation projects are **MANDATORY**. You cannot pass the course without doing **BOTH** projects.
5. You cannot switch discussion or lab sections without **PRIOR** permission.
6. We expect you to attend the discussion sections, and we will take attendance. More than **TWO** (excused or unexcused) absences will **DROP YOUR FINAL GRADE** by one letter (except for unusual circumstances). More than **FOUR** absences will **DROP YOUR FINAL GRADE** by two letters.
7. You must attend the lab sessions in order to write and submit lab reports. Attendance will be taken.
8. For excused absences from discussion or lab sections, notification by phone, e-mail, etc. **MUST** be given **BEFORE** the section begins.
9. Excused lab absences can be made up at the discretion of the instructors. If the equipment or materials available for that lab are no longer available, another lab may have to be substituted.
10. The **GRADING SYSTEM** for this course is based on your total percentage determined from your scores on the three midterm exams, the final exam, your two project presentation scores, your lab report scores, and your weekly assignments. These scores are weighted according to the percentages listed on the course outline. Based on grades from the last few years, you will probably need to get in the upper 80s to get an A, the upper 70s to get a B, and the upper 60s to get a C. Each lab instructor will tell you how the lab reports should be written and how they will be graded.