

Benedictine University – Springfield College in Illinois
New Horizons Adult Accelerated Program

PHS 104-70: Physical Science II IAI P0 900

Session C (May 9 – July 3), 2005, 3 credit hours

Prerequisite: One year of high school algebra

Location: Room W37

Time: Monday, 6 p.m. – 10 p.m.

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Course Goal

- To give the student an appreciation of the physical sciences.

Required Materials

- Tillery, Physical Science, 6th Edition, McGraw-Hill
- Calculator with the ability to perform scientific notation

Course Description

- Gives the basic principles of chemistry and earth sciences. Designed to give the non-science major and the education major an appreciation of the physical universe as well as some of the basic principles, which govern the universe. A historical perspective of contemporary science is also included.

Course Objectives

- To study the scientific method.
- To define atomic characteristics.
- To discuss the periodic table.
- To learn to name ionic and molecular compounds.
- To introduce Organic chemistry.
- To interpret weather and climate formations.
- To investigate the concept of Plate Tectonics
- To introduce the building and shaping of the earth' structure
- To introduce the patterns of the atmosphere, weather, and water systems of the earth

Springfield College in Illinois Mission Statement and Student Learning Outcomes; Specific Learning Outcomes for PHY 104 Physical Science 11

SCI Mission Statement

The mission of Springfield College in Illinois is to provide students the best liberal arts education in the Ursuline tradition of a nurturing faith-based environment. We prepare students for a life of learning, leadership and service in a diverse world.

Common Student Learning Outcomes- SCI

Springfield College is committed to preparing students for a life of learning, leadership, and service in a diverse world. As a result of the College's Associate Degree Programs, graduates will develop:

Content Knowledge (Lifelong Learning)
§ Know and apply the central concepts of the subject matter
§ Use current research to support assumptions and beliefs
§ Use technology to enhance learning

Communication Skills (Lifelong Learning and Leadership)
§ Communicate effectively in oral and written forms

Problem-Solving Skills (Lifelong Learning and Leadership)
§ Use inquiry and collaboration to solve problems
§ Seek information and develop an in-depth knowledge base, grounded in research
§ Use self-reflection to enhance personal growth and understanding of content

Social Responsibility (Service and Leadership)
§ Evaluate how choices and actions affect others
§ Make ethical and informed decisions
§ Develop good citizenship

Global Perspectives (Diversity)
§ Recognize the importance of diversity of opinion, abilities and cultures

Self-Direction and Personal Growth (Lifelong Learning)
§ Develop a sense of intellectual curiosity

Course outcomes: Upon completion of this course students will be able to:

- ❑ Follow the scientific method of reasoning; assessment 5/9/05
- ❑ Describe the major atomic particles; assessment 5/9/05
- ❑ Name and describe elements from the periodic table; assessment 5/9/05
- ❑ Name ionic and molecular compounds and write formulas for ionic and molecular compounds; assessment 5/16/05
- ❑ Understand the application of Plate Tectonics to present day land formations. Apply patterns of weather and building of the earth to everyday life; assessment 5/30/05; 6/6-13-20/05
- ❑ To illustrate the systems of water sources on the earth; 6/20/05

Teaching Methods

- ❑ Course material will be presented through lectures, class discussions, audiovisual presentations, demonstrations, and reading assignments. Exam questions will come from the readings, class lectures, independent work assignments, and problem-sets. Therefore, attending class and taking quality notes will be critical to doing well in this class. Students should read the material to be covered in advance of attending class. Class participation is strongly encouraged. In addition, students are encouraged and expected to ask questions during class (class participation) so that class material can be fully understood.

Attendance Policy

- ❑ Students are expected to arrive on time. If you arrive late, then you may be counted as absent for part of that class.
- ❑ Students are expected to wait until the end of class to leave the room. If you leave class before its conclusion, then you may be counted as absent for part of that class.
- ❑ Although it is strongly discouraged, students are allowed to incur 6 hours absence. Students **MUST** call, e-mail, and/or contact the instructor **PRIOR** to missing class. Students are held responsible for all missed material resulting from absences.
 - A late arrival can be counted as part of an excused absence with the final decision of the instructor.
- ❑ If a student incurs more than 6 hours of absence, then the student may be issued a failing grade for the class. SCI policy for excused absence will be followed.

Course Format

- ❑ **Exams:** This course will include 3 non-cumulative exams. The exam format could consist of: multiple choice questions, matching sections, fill-in-the-blank questions, and short answer questions. Short essay questions may also be included on tests, but the instructor will notify the students of what specific topic(s) the essay(s) will cover. Exams will cover material from assigned readings, lectures, assignments, quizzes, guest speakers, labs and all other material covered within or assigned in class. **No make-up tests** will be allowed unless authorized by the instructor.
- ❑ **Quizzes/Assignments:** There will be no make-up quizzes or assignment. They are expected to be completed and handed-in on time.
- ❑ **Project:** The class will include a 10 to 15 minute poster or PowerPoint presentation, in pairs, given on the last day of class (June 27th). Groups and a topic will be selected by May 30th and approved by the instructor. Further information (poster/ppt. format, presentation requirements and format, and grading guidelines) will be discussed on the 30th of May in class.
- ❑ **Late policy:** For assignments not handed in on time of the due date, 10% will be taken off for each additional late day. Each student will be allowed 1 opportunity to hand in a late assignment. The instructor reserves the right to not except late assignments.

Grading Breakdown (tentative)

Exams I, II, III	100 pts. each (3)
Assignments/Quizzes/Lab assignments/Problem sets	15 pts. each (7)
Poster/ppt. Presentation	<u>60 pts.</u>
<i>Extra credit: 10 pts. perfect attendance</i>	465 total pts

Grading Scale: (Floating bottom)

A (90-100%), **B** (80-89%), **C** (70-79%), **D** (60-69%), **F** (< 60%)

TENTATIVE COURSE OUTLINE

May 9

Due: Assignment 1* refer to assignment for reading requirement**

Chp. 1. What is Science: What is science?; Measurement and its application; The nature of science: The scientific method

Chp. 8. Atoms & the Periodic Table: Atomic structure: the electron & the nucleus; Bohr's model & Bohr's theory; Quantum mechanics, electron configuration, & the periodic table

Chp. 9. Chemical Bonds: Compounds, chemical change, valence e⁻, ions; Chemical bonds: ionic & covalent bonds

May 16

Quiz 1: Chp. 10 & 11

Chp. 10. Chemical Reactions: Chemical formulas and application; Balancing chemical equations; Main types of chemical reactions; Information derived from chemical equations

Chp. 11. Water & Solutions: Properties of water: structure, solution, & solubility; Properties of water solutions; Acids, bases, & salts

Guest Speaker/ Lab: TBA

May 23

Quiz 2: Chp. 12 & 13

Chp. 12. Organic Chemistry: Organic compounds: hydrocarbons & its categories; Petroleum; Hydrocarbon derivatives: alcohol, esters, aldehydes, etc.; Proteins, carbohydrates, fats and oils, & synthetic polymers

Chp. 13. Nuclear Reactions: The basics on radioactivity, radioactive decay, & nuclear energy: nuclear fission, nuclear fusion, & nuclear power plants

May 30

*******Test 1: Chp. 1, 8, 9, 10, 11, 12, 13**

Due: Assignment 2

Chp. 17. Rocks & Minerals: Overview of Earth's materials; Mineral formation; Types of rock: igneous, sedimentary, & metamorphic; The rock cycle

Chp. 18. Plate Tectonics: Earth's internal structure; Theory of plate tectonics: magnetic field, ocean, lithosphere plates & boundaries

Project: Group & topic selection due

June 6

Quiz 3: Chp. 19 & 20

Chp. 19. Building Earth's Surface: Diastrophism and its effects: stress, strain, folding, faulting; Overview of earthquakes; How mountains form?

Chp. 20. Shaping Earth's Surface: Overview of weathering, erosion, & transportation of solids & dissolved materials; Soil & Erosion: water, glaciers, & wind; Landscape development

Lab: Soil kits

Computer Lab: PowerPoint introduction

June 13

*******Test 2: Chp. 17, 18, 19, 20**

Due: Assignment 3

Chp. 21. Geologic Time: Overview of fossils; Interpreting rocks & geology; Geologic time scale & its eras

Chp. 22. The Atmosphere of Earth: Atmosphere: composition, pressure, warming, & structure; The affect of wind; Water's significance; Fog & clouds

June 20

Quiz 4: Chp 23 & 24

Chp. 23. Weather & Climate: Cloud formation & how precipitation arises; Weather factors: air masses, fronts, waves & cyclones, storms; Overview of and reasons for different climates

Chp. 24. Earth's Waters: Earth's waters: freshwater, surface water, groundwater; Seawater: A detailed overview of sea and ocean principles

Lab: Water testing

Guest Speaker: TBA

June 27

Project: Pairs-Poster or PowerPoint Presentation?

*******Test 3: Chp. 21, 22, 23, 24**

Classroom Assessment Technique

Goals, objectives, and learning outcomes that will be assessed in the class are stated in this syllabus. The instructor will use pre-tests and post-tests, background knowledge probes, directed paraphrasing, reflective essays or other Classroom Assessment Techniques as deemed necessary in order to provide continuous improvement of instruction. Students are required to take part in all assessment measures.

Cell Phone Policy

- The use of cell phones is prohibited unless you notify the instructor of special situations such as jobs that require you to be on-call or personal emergency situations that require you to be immediately accessible.

Calculator Policy

- Calculators will be used on certain exams (not all); no other materials may be used during an exam unless they are provided by the instructor at the time of the exam (periodic table, etc.).
 - Please see Required Materials for more information on calculators.

Americans With Disabilities Act (ADA)

- Springfield College in Illinois provides individuals with disabilities reasonable accommodations to participate in educational programs, activities, and services. Students with disabilities requiring accommodations to participate in college-sponsored programs, activities, and services or to meet course requirements should contact the Dean of Student Affairs as early as possible.

PHS 104 Monday: 6-10pm
Assignment 1: Due May 9th
Chp. 1: What is Science?
Chp. 8: Atoms and the Periodic Table
Chp. 9: Chemical Bonds

Answer the questions completely to the best of your abilities. For math calculations, show all the necessary steps (formulas, calculations, conversions) by hand and box the final answer. This assignment is to be handed in at the beginning of class on the 9th of May, 2005 at 6 pm. **NOTE:** Read the chapters to help answer the questions, but **SKIP pages 212- 217; 241-249 (explanation in class)**

Chp. 1

1. What are objects, concepts, and properties and how do they relate to physical science?
2. How do measurement systems help in the area of science? Why is this important?
5. Kilometer span is the same as how many meters?
6. One-half liter of water is the same volume as how many cm³?
7. One day, 24 hours, is the same as how many seconds?

8. The tallest basketball player on campus is 6 feet 2 inches tall. What is her height in cm?
9. A candle with a certain weight melts and the resulting weight of the wax is
- 1 – less.
 - 2 – the same
 - 3 – greater.
 - 4 – answer varies
11. Compare the density of ice to the density of water. The density of the ice is
- 1 – less
 - 2 – the same.
 - 3 – greater.
 - 4 – answer varies
12. Water in a glass has a mass of 123.0 grams and a volume of 68 mL. What is the density of the water?
13. What is the mass of a cube that has a density of 42.0 g/cm^3 and the volume of 19.0 cm^3 ?
14. A house is 200 meters long, 17 meters tall, and 21 meters deep. What is the area and volume of the house?

15. Use the steps of the Scientific Method (Define Problem, Make Hypothesis/Predictions, Test Hypothesis, Draw Conclusion) to run a simple experiment about the probability of getting heads versus tails when flipping a coin 50 times. To get the probability, take the number of heads or tails (whichever you choose) that resulted from your experiment and divide that number by the total number of trials, 50. $P = \# \text{ heads or tails (outcomes)} / \text{total number of trials (possibilities)}$. You should get close to that percentage of heads or tails each time you do this experiment (replicas).

Chp. 8

16. What are electrons, protons, and neutrons? How are they related to the nucleus and the atom?

17. What are isotopes? Give 1 isotope of Oxygen.

18. Give the mass number and atomic number of Chlorine and the isotope O^{18}_8 (look at the periodic table in the back of the book on the cover). How many neutrons do these molecules have?

Example: $C^{12.01}_6$ -There are 6 proton and electrons (atomic number)
-The atomic weight is 12.01

* $12.01 - 6 = 6.01$ neutrons

* $6 \text{ protons} + 6.01 \text{ neutrons} = 12.01$ mass number

19. What is the frequency of green light whose energy of a photon is 9.03×10^{-19} J?
(Enter 9.03×10 **yx** key -19 get on calculator for further manipulation- multiplication, etc.)
20. How is the periodic table organized? (Give a brief description regarding some key terms on pages 218-220)

Chp. 9

21. How would you think that atoms and molecules are related to chemical reactions?
22. How are valence electrons and the octet rule related? Explain this using the compound NaCl.
23. What is the difference between an ionic and covalent bond? Elaborate! You may use an example if it helps in the explanation.

24. Which of the following substances is NOT a compound?
- 1 – water
 - 2 – table salt
 - 3 – neon
 - 4 – rust
25. Propane gas burns in oxygen to produce carbon dioxide and water and energy.
The reactant(s) in this reaction are:
- 1 – energy
 - 2 – oxygen
 - 3 – carbon dioxide
 - 4 - water
26. Propane gas burns in oxygen to produce carbon dioxide and water and energy.
For this reaction, energy is
- 1 – absorbed
 - 2 – released
 - 3 – equal on both sides of the reaction
 - 4 – completely consumed in the reaction
27. When bonds are broken during a chemical reaction,
- 1 – energy is absorbed
 - 2 – energy is released
 - 3 – energy is created
 - 4 – both 1 and 2