

8. STUDENT LEARNING OUTCOMES

At the end of the course, the student will be able to:

1. Discuss the implications and limitations of the scientific method.
2. Explain the relationship between technological innovation and scientific understanding
3. Accurately and precisely report measurement observations of various physical and chemical properties.
4. Make qualitative and quantitative predictions using principles of measurement and relationships of scientific phenomena.
5. Describe motion in terms of measured kinematic variables and relate it to abstract concepts of force, momentum, and energy.
6. Explain the unifying principles of Newton's Laws of Motion and how they relate to static and dynamical equilibrium.
7. Predict phenomena associated with gravitation including projectile motion, orbits of satellites and planets around the sun, weightlessness, and tides.
8. Use concepts of density and pressure to explain phenomena associated with fluids including buoyancy, flotation, hydrostatic pressure, and Bernoulli's principle.
9. Use concepts of thermal energy, temperature, and heat to explain phenomena associated with thermodynamics including absolute zero, entropy, heat capacity, thermal expansion, conduction, convection, radiation, and phase change.
10. Use concepts of charge, voltage, electric current, and resistance to explain phenomena associated with electromagnetism including electric and magnetic forces and fields, Ohm's Law, electric circuits, electric power, magnetic poles, electromagnetic induction, motors and electrical generators, and transformers.
11. Describe and analyze features of oscillations and waves including speed, amplitude, wavelength, and frequency.
12. Measure properties of sound both qualitatively and quantitatively including the wave nature of sound, intensity, pitch, and the speed of sound.
13. Explain physical properties light including reflection, refraction, absorption, and polarization.
14. Describe the electromagnetic spectrum and relate its physical characteristics to wavelength, frequency, energy, and color.
15. Explain the relationship between light and matter including atomic spectra and thermal radiation.
16. Predict features and characteristics of atoms using atomic theory including descriptions of the mass, charge, and spatial distribution of subatomic particles.
17. Use measurement and scaling techniques to characterize atomic and molecular scales
18. Describe the connection between electron energy levels, light, and chemical bonding.
19. Explain the major features associated with the Periodic Table of Elements in terms of atomic theory including the order, column and row position, and general trends of elemental properties.
20. Qualitatively explain types of nuclear reactions including radioactivity, nuclear fission, and nuclear fusion.
21. Use the concept of half-life to predict properties of radioactive nuclei.
22. Distinguish between elements, compounds, homogeneous and inhomogeneous mixtures.
23. Explain the mechanisms of solubility and solution chemistry in terms of material properties and atomic and molecular theory.
24. Use the chemical and physical properties of known substances to make identifications of unknown substances.
25. Describe and differentiate between common chemical compounds using chemical formulae and naming conventions.

26. Classify and describe the properties of ionic and covalent compounds using theoretical and empirical techniques.
27. Classify and describe the properties of acids and bases using theoretical and empirical techniques including the measurement of pH.
28. Describe and predict the properties of chemical reactions using concepts of chemical bonds and the abstractions of chemical equations.
29. Describe and evaluate the features of common combustion, corrosion, acid/base neutralization, and oxidation-reduction reactions.
30. Explain the relationship between chemical bonding and energy and differentiate between exothermic and endothermic reactions.
31. Describe the special role of carbon in organic chemistry and explain the complex nature of organic compounds.

9. TOPICAL COURSE OUTLINE:

1. Introduction to the scientific method, quantitative reasoning, and scientific measurement
2. Newtonian mechanics
3. Gravitation
4. Thermodynamics
5. Electromagnetism
6. Waves and sound
7. Electromagnetic radiation
8. Atomic and nuclear theory
9. Periodic Table of Elements
10. Physical and chemical properties of materials
11. Chemical compounds and bonding
12. Chemical reactions
13. Solution chemistry including acids and bases
14. Organic chemistry

10. TEXTS AND MATERIALS USED: List of suggested books and/or materials suggested for this course.

Hewitt, P. et al. *Conceptual Physical Science 3e*. Pearson Addison-Wesley, 2003.
 Laboratory documents provided by the instructor.

11. AMOUNT OF WRITING REQUIRED:

Homework problem sets and exams including conceptual questions and quantitative reasoning. Students report observations and answer conceptual questions based on laboratory work during class. Some instructors assign written projects and reports as a portion of the required classwork.

12. METHODS OF EVALUATION: (Direct and indirect)

Homework (and projects):	35%
Lab work	25%
Three unit examinations:	15%
Cumulative final exam:	25%

13. AUTHORIZED SIGNATURE AND FILE DATE: DEPARTMENT AND CAMPUS

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 Harold Washington College