Survey of Chemistry and Physics

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| **C-ID Number** | CHEM 140 |
| **Discipline** | Chemistry |
| **Date Approved** | December 21, 2012 |

## General Course Description

An investigation of basic principles of physics and chemistry including matter, physical and chemical properties, energy, motion, light, atomic structure, bonding, solutions and chemical reactions. The inter-dependence of chemistry and physics will be emphasized. This course is intended for non-science majors.

## Minimum Units

4 units (3 Units Lecture, 1 Unit Laboratory)

## Any rationale or comments

This course is a one semester course on chemistry and physics that is usually taken by future elementary school teachers. These students will often also take an Earth science course that covers topics in astronomy, geology, meteorology, and oceanography.

## Advisories/Recommendations

None

## Course Content

Measurement and Fundamental Properties

Fundamentals of measuring length, area, volume and mass
Density of materials
The Scientific Method

Structure of Matter

Atomic theory and basic atomic structure including the relationships between sub-atomic particles
Periodic Table of Elements and periodic trends to atomic structure
Characteristics of the atomic, ionic, and molecular classes of matter
Phases of matter (solids, liquids, and gases) and the connections between the properties using a particle model
Classification of matter--elements, substances, compounds, mixtures
Basic characteristics of solutions, including acids and bases, and their relationship to the pH scale

Matter and its Changes

Phases of matter and associated phase changes
Chemical and physical changes, and classifying chemical and physical properties of matter
Basic principles of chemical bonding and chemical reactivity
Energy changes during chemical reactions

Motion, Forces and Energy

Motion of objects as related through the concepts of position, displacement, speed, velocity, and acceleration
Interpretation of distance vs. time and speed vs. time graphs
The relationship between a net force and the motion of an object
Explain how action and reaction forces are related to each other
Basic forces in the universe including electrostatic, gravitational and magnetic
Forms of energy including solar, chemical, magnetic, electric, nuclear, and thermal
The relationship between net force, work, and kinetic energy
Conservation of energy, and how energy is transformed from one form to another
The nature of heat (thermal energy) and heat transfer (conductive, convective, radiant) and their relationship to temperature and temperature measurement

Electricity and Magnetism

Electric charge and how charge is transferred from one object to another
Models of electric current, voltage, resistance and their interrelationships
The construction and operation of simple electrical circuits and the difference between series and parallel combinations of resistors

Waves and Light

Longitudinal and transverse waves
Properties of sound
Doppler effect and Interference
Electromagnetic radiation (light), the electromagnetic spectrum and sources of light
Relationship between wavelength (or frequency) and color
Color perception
Reflection and refraction of waves

## Laboratory Activities

Laboratory activities should cover the range of topics designated for lecture. The majority of labs should be hands-on activities with “real-world” data collection as opposed to computer simulation.  If possible a guided inquiry approach to this course where lecture and laboratory are integrated is suggested.

## Course Objectives

At the conclusion of this course, the student should be able to:
Lecture Objectives

Describe the states of matter and associate phase changes.
Classify matter as elements, compounds, mixtures and describe properties of each.
Describe basic atomic structure including the fundamental particles and electron energy levels
Explain the history and structure of the periodic table.
Explain and describe different ways atoms combine to form compounds.
Describe the motion of objects as related through the concepts of position, displacement, speed, velocity and acceleration.
Use Newton’s Laws to predict and explain the motion of an object.
Discuss the type of energy present in a system and use conservation of energy to solve problems.
Explain the requirements for a complete circuit in terms of a model of electric charge.
Describe color perception based on the wave nature of light and its interactions.

Laboratory Objectives

Understand fundamentals of taking and recording measurements including measuring length, area, volume, mass, density, significant figures, converting between units and scientific notation.
Practical applications to both the chemistry and physics lecture objectives.
Drawing conclusions between data and results including constructing graphs and identifying relationships between variables.

Suggested Student Learning Outcomes

Correctly analyze natural phenomena using the concepts of physics and chemistry.
Investigate physical phenomena using appropriate equipment and methods, make valid comparisons with theoretical predictions, and communicate those results.

## Prerequisites

Elementary Algebra

## Corequisites

None

## Methods of Evaluation

Exams/Tests
Quizzes
Research Projects
Papers
Oral Presentation
Group Projects
Home Work
Lab Activities

\*Note: Not all of the methods listed above are required. This is just list of possible evaluation methods.

## Sample Textbooks

Nanes, R., Inquiry into Physical Science – A Contextual Approach
Hewitt, Suchocki, and Hewitt, Conceptual Physical Science
Hewitt, Suchocki, and Hewitt, Laboratory Manual for Conceptual Physical Science
Tillery, B, Physical Science
Shipman, Wilson, and Todd, An Introduction to Physical Science
Tillery, B, Laboratory Manual to accompany Physical Science
Laboratory Manuals produced in house

## Notes