C-ID Descriptor
Survey of Chemistry and Physics

Descriptor Details

- **Descriptor Title**: Survey of Chemistry and Physics
- **C-ID Number**: 140
- **Units**: 4
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General 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.

Prerequisites

Elementary Algebra

Corequisites

No information provided

Advisories

No information provided

Content

Measurement & 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

Lab 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.

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.

Evaluation Methods

- 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.

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