M2 Science & Technology

Course Syllabus - 2024 Term 2

Teacher: Mai Phuong Nguyen Thi

Department: Science

Subject Code: SC22102

Periods per week: 3

Credits: 1.5

Course Description

This course will focus on the fundamental concepts of physical science. The course will begin with an exploration of the properties of matter, and then transition into an examination of the arrangement, patterns, and uses of the periodic table of elements. The course concludes with an introduction of materials, such as polymers ,monomers and composites

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Course Content

1. Properties of Matter
    1.1. Classifying Matter
    1.2. Physical Properties
    1.3. Physical Changes
    1.4. Chemical Properties and Chemical Changes

2. The Atom
    2.1. Atomic Particles and Models
    2.2. How Atoms Differ

3. The Periodic Table
    3.1. Introduction to The Periodic Table of Elements
    3.2. Metals
    3.3. Nonmetals and Metalloids

4. Chemical Bonds
    4.1. Electrons and Energy Levels

4.2. Compounds and Covalent Bonds
4.3. Ionic and Metallic Bonds

5. Materials
   5.1. Polymers and Monomers
   5.2. Composites

Learning Outcomes

- Recognize that elements are made from only one type of particle known as an atom.
- Describe how symbols represent atoms of different elements and the conventions for writing these symbols.
- Understand the chemical properties of each substance in the mixture are unchanged.
- Classify compounds according to their properties.
- Explain why physical properties can be observed or measured without changing the identity of the matter.
- Discuss the physical properties of various substances.
- Recognize which physical properties are size-dependent and which are size-independent.
- Explain changes in state of matter from adding or removing thermal energy.
- State examples of physical changes.
- Explain the physical methods to separate the substances in a mixture.
- Distinguish how chemical properties are observed in contrast from physical properties.
- Use the concept of conservation of mass to explain that all atoms involved in a reaction must be accounted for.
- State the common signs that a chemical change has occurred.
- Attribute the discovery of atomic structures to the responsible scientists and experiments.
- Describe the structure of an atom in terms of protons, neutrons and electrons.
- State the charges on subatomic particles.
- Discuss the differences between elements in terms of the number of protons, neutrons and electrons they have.
- Define the terms atomic number and mass number.
- Recognize atoms that lose electrons become positively charged ions and atoms that gain electrons become negatively charged ions.
- Explain the problems that early scientists encountered when studying the elements.

- Interpret the periodic table to work out the number of each type of sub-atomic particle for a named atom.
- Use the pattern of the electron arrangement of elements within a group to predict the behavior of other members of the group.
- Evaluate the modern periodic table as a means of obtaining greater understanding of chemical reactions.
- Explain the trends found within specified periodic table groups
- Explain that alkali metals react with non-metals to form ionic compounds in which the metal ion has a single positive charge.
- Describe and explain the properties of named transition elements.
- Use the idea of electron shells to describe electron arrangements for elements up to atomic number 20.
- Recognize that compounds made from a metal and a nonmetal are made from ions.
- Describe the bonding in nonmetal compounds as covalent.
- Describe the structure of metals, and explain why they conduct electricity.
- Use the structure of metals to explain their ability to bend and be shaped.
- Describe how forces occur in pairs, acting on different objects.
- Explain the term ‘polymeriation’ and what humans can do with polymers.
- Describe different types of polymers, synthtic and organic.
- Explain what composites are and how humans use these materials
- Create a product from a previously used material ‘upcycling’ for student engagement.

Learning Resources

Mcgraw Hill interactive online student textbook

Interactive Slideshow Presentation

BoardWorks

Khan Academy

AumSum Time

PhET Simulations

Assessment Methods

Students will be assessed on both their theoretical and practical mastery of the content using in-class participation, classwork and homework as book problems and worksheets, subunit quizzes, laboratory performance including reports and write-ups, unit tests, and final examination.

Unit tests and the final exam will include a range of problems. About 50% of the exam will consist of problems that will cover the fundamental skills. About 25% of the

exam will consist of problems that will require a deeper understanding of each topic and will require students to combine skills from several topics. About 25% of the exam will consist of real-world application problems.

Homework Policy

Any late assignments will receive a maximum score of 50% of the total possible points.

Two weeks after the due date, assignments will not be accepted and a grade of 0 will be given.

If students are absent when assignments are assigned or on an assignment due date it is the responsibility of the student to contact the teacher to make arrangements for submission.

Evaluation Breakdown

Assessments ● Unit Tests ● Lab Practical Exam	30%
Student Work ● Classwork & Homework ● Labs & Projects	50%
Final Exam	20%

Thai National Curriculum Standards

<u>Strand 3: Substances and Properties of Substances</u>

Standard Sc3.1: Understanding of properties of substances; relationship between properties of substances and structures and binding forces between particles; investigative process for seeking knowledge and scientific mind; and communicating acquired knowledge for useful purposes

> Sc3.1 Gr. 8/1: Explore and explain components and properties of elements and compounds.
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> Sc3.1 Gr. 8/2: Search for data and compare properties of metallic, non-metallic semi metallic and nuclear elements and apply the knowledge gained for useful purposes.

Sc3.1 Gr. 8/3: Experiment and explain principles of substance separation by applying methods of filtering, crystallization, expunctions, distillation and chromatography, and apply the knowledge gained for useful purposes.

Strand 8: Nature of Science and Technology

Standard Sc8.1: Application of scientific processes and scientific mind in investigation for seeking knowledge and problem solving; knowing that most natural phenomena assume definite patterns that are explainable and verifiable within limitations of data and instruments available during particular periods of time; and understanding that science, technology, society and the environment are interrelated

Sc.8.1 Gr. 8/1: Pose questions prescribing the issues or important variables for exploration and verification or conduct comprehensive and reliable study and research on matters of their interest.

Sc.8.1 Gr. 8/2: Make verifiable hypotheses and plan several methods for exploration and verification.

Sc.8.1 Gr. 8/3: Select techniques and methods for quantitative and qualitative exploration and verification yielding accurate and safe results by using appropriate materials and equipment.

Sc.8.1 Gr. 8/4: Collect data and process it quantitatively and qualitatively.

Sc.8.1 Gr. 8/5: Analyse and evaluate conformity of eye-witnesses with the conclusions both supporting or contradicting the hypotheses and data abnormality from exploration and verification

Sc.8.1 Gr. 8/6: Create models or formats explaining or showing results of exploration and verification.

Sc.8.1 Gr. 8/7: Pose questions leading to exploration and verification of relevant matters, and apply the knowledge gained in new situations or to explain the concepts, processes and results of the project or task for others to understand.

Sc.8.1 Gr. 8/8: Make a record and explain results of additional observation, exploration, verification and research from various sources of knowledge in order to obtain reliable data and accept changes in the knowledge discovered when presented with new and additional data, eye-witnesses or contradictory data.

Sc.8.1 Gr. 8/9: Display their work, write reports and/or explain the concepts, processes and results of the project or task so that others can understand.

[Total 14 indicators]