STRISUKSA SCHOOL • ENGLISH PROGRAM

CHEMISTRY

Course Curriculum & Detailed Lesson Plans Portfolio

Instructor:	Teacher Ferlie Agraviador
Course Level:	Level Mattayomsuksa 4 (M.4)
Academic Year:	2026 – 2027
Curriculum Scope:	Units 1 – 8 (60 Instructional Hours)

LESSON PLAN

Topic: Laboratory Safety and Scientific Skills **Unit:** Unit 1 **Subject:** Chemistry 1

Level: Level Mattayomsuksa 4 **Times:** 6 Hours

Teacher: Ferlie Agraviador

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1. Strand:

Strand 2: Physical Science (Standard SC2.1 - Understands the nature of matter, chemical bonding, properties of substances, and tracking experimental chemistry data safely).

2. Grade level indicators:

Indicators 1 – 3

3. Important Concept:

Strict adherence to standardized laboratory safety practices, emergency containment rules, and proper instrumentation processing constitutes the vital foundation of all experimental chemical analysis. Accurate data logging and structured synthesis of experimental parameters within formal laboratory reports are essential to ensure the reproducibility and baseline credibility of scientific claims.

4. Objective:

By the end of this instructional sequence, students will be able to: (1) Synthesize immediate hazard containment protocols and identify NFPA hazard diamonds and safety markers accurately. (2) Demonstrate precise selection and operation of analytical lab equipment, inclusive of volumetric glassware and Bunsen burners. (3) Delineate independent, dependent, and controlled variables within complex systems to construct coherent scientific lab reports.

5. Process of learning

Warm up

Students analyze real-world case studies detailing common school laboratory accidents. In peer groups, they isolate the precise rule failure that caused the hazard and discuss alternative precautionary pathways.

Presentation

Teacher conducts an interactive walkthrough mapping out chemical containment zones, immediate emergency eyewash/shower deployment sequences, and standard SDS sheets. The teacher models standard Bunsen burner operations, emphasizing air-valve adjustment mechanics for clean blue flame optimization and matching accuracy classifications of beakers vs. graduated cylinders.

Practice

Students participate in an instrumentation speed-identification rotation. Moving between lab benches, groups evaluate complex experimental configurations, spot intentional safety violations introduced by the teacher, and select the optimal measuring tools required for specific volumetric volumes.

Product

Students execute a localized, structured measurement exercise comparing fluid delivery tolerances. Using collected volumetric arrays, they isolate standard variations, structure an organized data graph, map out explicit procedural methodologies, and compile a formal lab report matching standard scientific journal structures.

Wrap up

Students perform an exit ticket task requiring them to draw three separate chemical symbol indicators (corrosive, toxic, flammable) and provide an immediate multi-step treatment sequence for an operational acid contact scenario.

6. Materials

Safety Data Sheets (SDS), Bunsen Burners, Variable Volumetric Glassware Arrays, NFPA Hazard Guidelines, Safety Goggles, Formative Report Rubrics.

Report after learning

1. Effect of learning.
2. Problem.
3. Recommendation.

(Teacher :Ferlie Agraviador)

LESSON PLAN

Topic: Measurement and SI Units
Unit: Unit 2
Subject: Chemistry 1
Level: Level Mattayomsuksa 4
Times: 4 Hours
Teacher: Teacher Ferlie Agraviador

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1. Strand:

Strand 2: Physical Science (Standard SC2.1 - Applies mathematical conventions and physical metrics to express chemical properties and quantitative states seamlessly).

2. Grade level indicators:

Indicator 4

3. Important Concept:

The International System of Units (SI) provides the universal metric system required for precise scientific documentation. Utilizing multi-step dimensional analysis through structured conversion factors ensures mathematical integrity, exact value preservation, and complete unit validation across cross-disciplinary measurements.

4. Objective:

By the end of this instructional sequence, students will be able to: (1) Recall the seven fundamental SI base units and effortlessly map metric prefixes from micro- (μ) to kilo- (k) across standard notation and base-10 exponential values. (2) Set up and solve complex factor-label unit configurations to handle compound derived units safely.

5. Process of learning

Warm up

Students analyze the historical collapse of the 1999 Mars Climate Orbiter mission caused by an uncorrected English-to-metric calculation mismatch, establishing the fundamental real-world necessity of global metric consistency.

Presentation

~~Teacher int~~roduces the prefix continuum, charting corresponding logarithmic values. The teacher builds factor-label arrays on the board, demonstrating the cross-cancellation of terms using compound chemical tracking units like density fractions (g/cm^3 to kg/m^3).

Practice

Students work in collaborative pairs using dry-erase whiteboards to map out multi-tiered dimensional arrays. Teams focus on converting highly distributed metrics (e.g., matching microgram values to kilogram equivalents) while ensuring strict mathematical conversion logic.

Product

Students solve an extensive numeric challenge set containing real-world chemistry conversion scenarios. They convert complex volume thresholds, calculate raw mass allocations using material density benchmarks, and maintain tracking criteria for every step.

Wrap up

The teacher evaluates student mastery via a cold-call operational check, requiring individual students to write out the precise conversion block required to shift a multidimensional metric value on the board without the aid of a calculator.

6. Materials

SI Reference Matrix Guides, Metric Calibration Blocks, Multi-step Calculation Problem Sheets,
Scientific Calculators.

Report after learning

1. Effect of learning.
2. Problem.
3. Recommendation.

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(Teacher :Ferlie Agraviador)

LESSON PLAN

Topic: Atomic Structure and Atomic Models **Unit:** Unit 3 **Subject:** Chemistry 1

Level: Level Mattayomsuksa 4 **Times:** 10 Hours

Teacher: Ferlie Agraviador

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1. Strand:

Strand 2: Physical Science (Standard SC2.1 - Evaluates the historical progression of atomic theories and details internal subatomic particle allocations).

2. Grade level indicators:

Indicators 5 – 7

3. Important Concept:

The modern understanding of atomic architecture is built upon a succession of experimental models. Quantifying subatomic configuration criteria through nuclear symbols and electronic ground-state configurations maps the internal behaviors that govern an element's reactivity.

4. Objective:

By the end of this instructional sequence, students will be able to: (1) Compare historical atomic frameworks, explicitly linking structural claims to experimental proof like the Gold Foil or Cathode Ray experiments. (2) Isolate subatomic particles from nuclear isotopic symbols. (3) Generate full electron configurations and orbital spin-arrow notations.

5. Process of learning

Warm up

Students handle opaque, sealed geometric boxes containing hidden objects. By observing tactile and acoustic clues, they model the process of indirect scientific analysis used by historical physicists to map the interior layout of atoms.

Presentation

Teacher details the atomic timeline from Dalton to the Quantum Cloud model, matching each leap to its defining experiment. The teacher introduces isotopic notation *&supA;X±* ^{Z} and maps out electron subshell allocations (s, p, d, f) using the Aufbau principle, Hund's rule, and the Pauli exclusion principle

Practice

Students complete a subatomic structure tracking chart, calculating exact counts of protons, neutrons, and electrons for various isotopes and highly reactive ion complexes. They practice drawing energy-level arrow diagrams on individual whiteboards.

Product

Students build 3D representations of specific isotopic states using colored indicators to map out nuclear density balances. They write out full structural electronic configurations and the corresponding noble gas shorthands for elements spanning periods 1 through 4.

Wrap up

Students participate in a review game where they compete to identify unknown reactive elements based solely on an isolated, terminal valence orbital description provided by the teacher.

6. Materials

3D Atomic Space Construction Elements, Spectral Gas Discharge Tubes, Comprehensive Periodic Tables, Subshell Mapping Worksheets.

Report after learning

1. Effect of learning.
2. Problem.
3. Recommendation.

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(Teacher :Ferlie Agraviador)

LESSON PLAN

Topic: Periodic Table and Element Properties **Unit:** Unit 4 **Subject:** Chemistry 1

Level: Level Mattayomsuksa 4 **Times:** 10 Hours

Teacher: Ferlie Agraviador

1. Strand:

Strand 2: Physical Science (Standard SC2.1 - Understands the structural organization of the periodic table, periodicity trends, and properties of nuclear decay stability).

2. Grade level indicators:

Indicators 8 – 12

3. Important Concept:

The periodic table is arranged by increasing atomic number, mapping repeating trends in chemical behavior. Understanding effective nuclear charge and electron shielding allows for the accurate prediction of element properties, nuclear stability boundaries, and half-life decay trajectories.

4. Objective:

By the end of this instructional sequence, students will be able to: (1) Predict shifting patterns in atomic radius, ionization energy, and electronegativity down groups and across periods. (2) Balance nuclear transformation equations involving alpha, beta, and gamma emissions. (3) Solve half-life decay problems and analyze environmental risks.

5. Process of learning

Warm up

Students organize arrays of data cards containing recurring structural values to replicate the analytical sorting process Mendeleev used to construct the initial periodic layout.

Presentation

Teacher defines effective nuclear charge (Zeff) and shielding mechanics to explain why periodic trends occur.

The teacher then transitions to nuclear chemistry, writing out balanced decay pathways and modeling exponential half-life tracking calculations using the core decay formula.

Practice

Students work in collaborative groups to analyze element sets, arranging them by increasing property metrics. They practice balancing nuclear transformation equations on practice sheets.

Product

Students execute a half-life simulation lab using coin arrays to collect statistical decay data. They plot these data points onto semi-logarithmic graph sheets to produce a standardized decay curve and solve practical tracking problems.

Wrap up

Students participate in a structured group discussion, evaluating the industrial utility of radioactive isotopes alongside the long-term containment challenges faced by storage operations globally.

6. Materials

Periodic Property Data Sets, Blank Structural Grid Templates, Radiometric Decay Simulators, Semi-logarithmic Graph Sheets.

Report after learning

1. Effect of learning.
2. Problem.
3. Recommendation.

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(Teacher Ferlie Agraviador)

LESSON PLAN

Topic: Ionic Bonding and Compounds **Unit:** Unit 5 **Subject:** Chemistry 1

Level: Level Mattayomsuksa 4 **Times:** 10 Hours

Teacher: Ferlie Agraviador

1. Strand:

Strand 2: Physical Science (Standard SC2.1 - Analyzes the formation of ionic bonds, chemical nomenclature, crystal thermodynamics, and wet chemistry reactions).

2. Grade level indicators:

Indicators 13 – 17

3. Important Concept:

Ionic bonding occurs via the complete electrostatic transfer of valence electrons from metallic elements to non-metallic acceptors. The resulting crystalline lattices possess distinct thermal and electrical properties, which can be quantified through energy cycles and net ionic equations.

4. Objective:

By the end of this instructional sequence, students will be able to: (1) Model valence electron shifts using Lewis dot notation to predict ionic properties. (2) Apply IUPAC nomenclature rules to write chemical names and formulas for binary and polyatomic salts. (3) Outline Born-Haber energy phases and write net ionic equations.

5. Process of learning

Warm up

Teacher tests the electrical conductivity of solid sodium chloride against an aqueous salt solution, prompting students to deduce the structural requirements for electrical current transport.

Presentation

Teacher details ionic crystal lattice energetics and maps out the five stages of the Born-Haber thermodynamic cycle. The teacher establishes the balancing rules of the criss-cross method for polyatomic salts and demonstrates how to isolate net ionic precipitation equations.

Practice

Students complete an intensive nomenclature matrix, converting chemical formulas into formal IUPAC names and vice-versa, covering multi-state transition metals and polyatomic combinations.

Product

Students perform a series of microscale precipitation reactions in the laboratory. They observe physical phase changes, document solubility parameters, and write out balanced molecular, complete ionic, and net ionic equations for each reaction.

Wrap up

Teams participate in a nomenclature board challenge, competing to accurately balance charges and write complete chemical names for complex multi-element ionic compounds.

6. Materials

Aqueous Ionic Solution Testing Kits, Electrical Conductivity Indicators, Nomenclature Formula Matrices, Born-Haber Cycle Structural Charts.

Report after learning

1. Effect of learning.
2. Problem.
3. Recommendation.

(Teacher Ferlie Agraviador)

LESSON PLAN

Topic: Covalent Bonding and Molecular Structure **Unit:** Unit 6 **Subject:** Chemistry 1

Level: Level Mattayomsuksa 4 **Times:** 12 Hours

Teacher: Ferlie Agraviador

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1. Strand:

Strand 2: Physical Science (Standard SC2.1 - Understands the sharing of valence electrons, VSEPR 3D geometry models, and molecular polarity behavior).

2. Grade level indicators:

Indicators 18 – 21

3. Important Concept:

Covalent bonding involves the stable sharing of valence electron pairs between non-metallic elements. The specific three-dimensional geometry of these molecules, predicted via VSEPR theory, directly dictates structural characteristics and overall molecular dipole polarity values.

4. Objective:

By the end of this instructional sequence, students will be able to: (1) Synthesize comprehensive Lewis structures incorporating formal charge verification and resonance pathways. (2) Apply VSEPR theory to identify molecular shapes based on steric parameters. (3) Predict molecular polarity via vector symmetry evaluations.

5. Process of learning

Warm up

Students observe the interaction of macro balloon clusters tied at a central point, mapping out how shared physical domains naturally maximize spacing to replicate electron pair repulsion behavior.

Presentation

~~Teacher outl~~ines the step-by-step methodology for constructing Lewis models, tracking valence electron allocations, and evaluating formal charge distributions. The teacher presents VSEPR geometries and shows how asymmetric geometry distributions prevent dipole cancellation, resulting in molecular polarity.

Practice

Students practice drawing complex Lewis models on large whiteboards, tracking resonance pathways for common polyatomic anions and identifying localized steric variations.

Product

Students use 3D molecular model components to construct physical representations of assigned chemical formulas. They measure bond angles, identify molecular shapes, draw physical dipole vectors, and predict solubility behavior based on polarity.

Wrap up

Students write a concise paragraph comparing the physical differences between carbon dioxide and sulfur dioxide, explaining why their distinct shapes lead to opposite polarity profiles.

6. Materials

3D Molecular Space Modeling Components, Structural Balloons, Steric Assignment Guidelines, Polarity Demonstration Fluids.

Report after learning

1. Effect of learning.
2. Problem.
3. Recommendation.

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(Teacher Ferlie Agraviador)

LESSON PLAN

Topic: Intermolecular Forces and Network Solids

Unit: Unit 7

Subject: Chemistry 1

Level: Level Mattayomsuksa 4

Times: 4 Hours

Teacher: Ferlie Agraviador

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1. Strand:

Strand 2: Physical Science (Standard SC2.1 - Evaluates attractions between discrete molecules and differentiates the structural lattices of macromolecular network covalent solids).

2. Grade level indicators:

Indicators 22 – 23

3. Important Concept:

Intermolecular forces represent the non-bonding attractive interactions that exist between discrete molecular structures. The strength of these attractions determines macroscopic properties like boiling points, whereas network covalent solids utilize continuous covalent grids to achieve extreme thermal and mechanical stability.

4. Objective:

By the end of this instructional sequence, students will be able to: (1) Classify intermolecular forces, distinguishing between London dispersion forces, dipole-dipole attractions, and hydrogen bonds. (2) Correlate the intensity of these forces with boiling points and evaporation thresholds. (3) Describe network covalent materials.

5. Process of learning

Warm up

Students record and compare the physical evaporation timelines of droplets of water, ethanol, and acetone placed simultaneously on a warm thermal block, brainstorming the molecular causes behind the varying evaporation rates.

Presentation

Teacher classifies the IMF continuum, linking temporary and permanent dipoles to structural parameters like molar mass and electronegativity differences. The teacher contrasts the continuous covalent bonding grid of network solids (e.g., diamond, graphite) with weak intermolecular attractions.

Practice

Students analyze data tables containing information on molecular weights and structural configurations to rank substances by their predicted boiling points, identifying the primary IMF present in each compound.

Product

Students execute a laboratory verification exercise measuring the surface tension profile and boiling thresholds of an array of liquids. They graph these phase parameters against molecular characteristics to document the impact of hydrogen bonding.

Wrap up

Students complete a comparative matrix contrasting the structural features, melting point boundaries, and structural differences observed between diamond, graphite, and quartz.

6. Materials

High-purity Solvent Test Sets, Electronic Boiling Point Analysis Hardware, Covalent Grid Structural Handouts, Material Property Data Charts.

Report after learning

1. Effect of learning.
2. Problem.
3. Recommendation.

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(Teacher Ferlie Agraviador)

LESSON PLAN

Topic: Metallic Bonding and Material Properties**Unit:** Unit 8 **Subject:** Chemistry 1

Level: Level Mattayomsuksa 4 **Times:** 4 Hours

Teacher: Ferlie Agraviador

1. Strand:

Strand 2: Physical Science (Standard SC2.1 - Analyzes the electron sea model of metallic systems, material mechanics, and industrial alloy compositions).

2. Grade level indicators:

Indicators 24 – 25

3. Important Concept:

Metallic bonding is defined by a lattice of metal cations surrounded by a highly mobile, delocalized 'sea of valence electrons'. This shared electronic mobility accounts for characteristic metallic properties like high thermal and electrical conductivity, malleability, and ductility, which can be modified by forming interstitial or substitutional alloys.

4. Objective:

By the end of this instructional sequence, students will be able to: (1) Explain the physical properties of metals using the electron sea model. (2) Differentiate between the structure and properties of interstitial and substitutional alloys. (3) Synthesize differences across ionic, covalent, and metallic solids.

5. Process of learning

Warm up

Students observe a mechanical stress test demonstrating the deformation behavior of a copper wire compared to the brittle fracture of a ceramic or salt block under identical mechanical pressure.

Presentation

Teacher introduces the electron sea model, showing how non-directional bonding allows metal planes to shift without causing lattice cleavage. The teacher models alloy structures, demonstrating how interstitial carbon atoms reinforce iron matrices to form high-strength steel alloys.

Practice

Students construct a comprehensive three-way Venn diagram comparing particle units, bonding forces, and physical properties across ionic, molecular covalent, network covalent, and metallic solids.

Product

Students design a technical reference sheet analyzing an industrial alloy common to modern Thai manufacturing (such as brass or structural steel), documenting its structural modifications and industrial applications.

Wrap up

Students submit an exit matrix summarizing the key structural units, primary bonding forces, and conductivity behaviors characteristic of the four primary solid classifications.

6. Materials

Malleability Demonstration Kits, Alloy Lattice Structural Charts, Solid Type Sorting Activity Cards, Comprehensive Review Guidelines.

Report after learning

1. Effect of learning.
2. Problem.
3. Recommendation.

(Teacher Ferlie Agraviador)