National Science Content Standards

**Content Standard A: Investigation and Experimentation**
As a result of activities in grades 5-8, all students should develop
- Abilities necessary to do scientific inquiry
- Understandings about scientific inquiry

**Content Standard B: Physical Science**
As a result of their activities in grades 5-8, all students should develop an understanding of
- Properties and changes of properties in matter

California State Content Standards Concepts

**Standards Concept 3: Structure of Matter**
Each of the more than 100 elements of matter has distinct properties and a distinct atomic structure. All forms of matter are composed of one or more of the elements.

**Standards Concept 7: Periodic Table**
The organization of the periodic table is based on the properties of the elements and reflects the structure of atoms.

**Standards Concept 9: Investigation and Experimentation**
Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations.
Content Standards

As a basis for understanding the concepts:

National A.
• Use appropriate tools and techniques to gather, analyze and interpret data.

National B:
• Students understand the properties and changes of properties in matter including the evidence and the logical arguments that support the particulate model of matter.

California 3.
  a. Students know the structure of the atom and know it is composed of protons, neutrons, and electrons.
Day 1

Learner Outcomes:
- During a pre-test students will demonstrate their beginning knowledge;
- During a teacher directed presentation of the unit objectives the students will gain an understanding of what they will be studying;
- During an in-class reading assignment students will gain a preliminary understanding of atomic structure and relevance;
- A short follow-up lecture by the teacher will reinforce the student’s understanding;
- A teacher directed discussion of the lecture and readings will allow students to clarify the subject and complete appropriate notes.

Assessments:
- Formative: Pretest of individual understanding of atomic structure;
- Formative: Teacher observations of participation
- Formative: Teacher observations of student notes.

Materials:
- Computer and projector (optional)

Instruction:
- Introduction to atomic structure: Pre-Reading;
- Short follow-up lecture;
- Teacher directed discussion.
Day 2

**Learner Outcomes:**
- During a short computer activity students will investigate atomic structure;
- During a computer aided hands on activity students will investigate the relative size of the atom and the nucleus;
- During a whole class activity Students will begin to assemble an atomic vocabulary list with definitions from their notes;
- In small groups students will review atomic structure and the vocabulary list.

**Assessments:**
- Formative: Assess accuracy of vocabulary lists during discussions.

**Materials:**
- Computers
- Strips of paper and scissors

**Instruction:**
- Teacher will introduce the computer animation activity;
- Teacher will hand out scissors and strips of paper and explain the computer assisted atomic size activity;
- Teacher will assist students in preparing their vocabulary list;
Day 3

**Learner Outcomes:**
- Working in pairs, students will solidify their understanding of atomic structure by making a labeled model of an atom;
- Through group discussion students will perfect their understanding of atomic structure.

**Assessments:**
- Formative: Quiz: Atomic structure and particles

**Materials:**
- Trix cereal – two colors only
- Cotton balls and tiny glitter stars
- Tiny self-stick labels and tooth picks

**Instruction:**
- Teacher will explain the activity
- Teacher will circulate through the groups and assist
- Teacher will give the quiz
Day 4

Learner Outcomes:
• Working in pairs on a short wet lab experiment students investigate the power of an element;
• During the lecture/discussion students will begin to understand the difference between particles, elements, atoms,
• Working in small groups students learn basic lab safety by creating a Lab Safety Manual.

Assessments:
• Lab rubric

Materials:
• Basic lab equipment
• Hydrogen peroxide and potatoes
• Empty film canisters with lids

Instruction:
• Teacher demonstrates safe laboratory procedure and equipment;
• Teacher describes the experiment;
• Students present lab safety lists;
• Teacher leads discussion on lab safety to form a Class Safety Manuel.
Day 5

Learner Outcomes:
• During a small group review, students will solidify their understanding of atomic structure;
• During a small group and whole class activity students will develop a class safety manual.

Assessments:
• Formative: Teacher observations

Materials:
• Curricular handouts

Instruction:
• Teacher will review safety procedures;
• Teacher will guide the writing of a safety manual.
Content Standards

As a basis for understanding the concepts:

National A.
• Use appropriate tools and techniques to gather, analyze and interpret data;

National B.
• Students develop an understanding of the properties and changes of properties in matter including the evidence and the logical arguments that support the particulate model of matter.
• Substances often are placed in categories or groups if they react in similar ways; metals is an example of such a group.
• A substance has characteristic properties, such as density, a boiling point, and solubility.

California 7.
 a. Students know how to identify regions corresponding to metals, nonmetals, and inert gases.
 c. Students know substances can be classified by their properties, including their melting temperature, density, hardness, thermal and electrical conductivity.
Day 1

Learner Outcomes:

- Through pre-reading and discussion that includes active student participation students will begin to add vocabulary words to their list;
- During a whole class reading assignment students will be introduced to atomic mass, atomic number and the periodic table;
- During computer aided practice students will learn to use the periodic table.

Assessments:

- Discussion rubric
- Vocabulary list

Materials:

- Computer and projector;
- Web access or downloaded web material
- Periodic Table and Periodic Table Template Handouts.

Instruction:

- Teacher will introduce the concept of grouping atoms;
- Teacher will lead the discussion of the readings;
- Teacher will guide the computer aided learning;
- Teacher will assess student understanding by using the discussion rubric and checking the vocabulary lists
Day 2

Learner Outcomes:
- During a hands-on investigation students will develop an understanding of the properties of elements including: metals, metalloids, non-metals;
- During a hands-on investigation students will investigate luster, hardness, conductivity and reactivity;
- Students will learn to collect and analyze data;
- By means of a homework assignment students will begin to solidify their understanding of the properties of elements and the use of the Periodic Table.

Assessments:
- Formative: Teacher will observe lab procedure and student skills;
- Summative: Homework assignment.

Materials:
- Curricular handouts;
- Standard lab equipment;
- Computers.

Instruction:
- Teacher will handout the experiment protocol;
- Teacher will orally explain what is expected;
- Teacher will observe students and assess their skills using the experiment rubric;
- Teacher will give students feedback and assistance.
Day 3

Learner Outcomes:
- During a hands-on investigation students will develop an understanding of the properties of elements including: metals, metalloids, non-metals;
- During a hands-on investigation students will investigate luster, hardness, conductivity and reactivity;
- Students will learn to collect and analyze data;
- By means of a homework assignment students will begin to solidify their understanding of the properties of elements and the use of the Periodic Table.

Assessments:
- Formative: experiment skills rubric
- Students will demonstrate their understanding by writing up the experiment.

Materials:
- Curricular handouts;
- Standard lab equipment;
- Computers.

Instruction:
- Teacher will handout the experiment protocol;
- Teacher will orally explain what is expected;
- Teacher will observe students and assess their skills using the experiment rubric;
- Teacher will give students feedback and assistance.
Day 4

Learner Outcomes:
- During a Pre-Reading activity students will learn about valence electrons;
- Working on small teams, during a computer simulation activity, students will demonstrate their accumulated knowledge about atoms, properties of elements and the periodic table.

Assessments:
- Student teams will demonstrate their understanding by completing the simulation.

Materials:
- Computers;
- Curricular handouts.

Instruction:
- During the computer simulation the teacher will evaluate individual student learning and offer assistance as needed.
Day 5

Learner Outcomes:
• During the computer simulation activity students will develop their understanding of the periodic table and properties of elements.

Assessments:
• Working in small teams, during a computer simulation activity students will demonstrate their accumulated knowledge about atoms, properties of elements and the periodic table;
• During a team oral presentation students will demonstrate their understanding of the periodic table.

Materials:
• Computers;
• Curricular handouts.

Instruction:
• During the computer simulation the teacher will evaluate individual student learning and offer assistance as needed;
• During the oral team presentations the instructor will evaluate student understanding.
Week 3

Content Standards

As a basis for understanding the concepts:

National A.
- Use appropriate tools and techniques to gather and analyze, and interpret data;

National B.
- Substances react chemically in characteristic ways with other substances to form new substances (compounds) with different characteristic properties;
- Students develop an understanding of the properties and changes of properties in matter including the evidence and the logical arguments that support the particulate model of matter;

California 3.
  b. Students know that compounds are formed by combining two or more different elements and that compounds have properties that are different from their constituent elements;
  f. Students know how to use the periodic table to identify elements in compounds;

California 9.
  a. Plan and conduct a scientific investigation to test a hypothesis;
  b. Evaluate the accuracy and reproducibility of data.
Day 1

Learner Outcomes:
• During an inquiry lab, students will investigate mixtures;
• During a small group lab, students will test their ideas;

Assessments:
• Formative: Teacher observes student understanding of the content and student skills during the lab. Lab grading rubric.

Materials:
• General lab equipment;
• Curricular handouts
• Magnets, Styrofoam cups, Funnels, Coffee Filters, Plastic spoons
• 1-2% Iodine

Instruction:
• During silent lab time, the teacher will assist individual students as they formulate ideas for separating the mixtures;
• The teacher will assist students in displaying their ideas on the board;
• During a small group lab the teacher will assist groups in testing their ideas;
Day 2

**Learner Outcomes:**
- During a small group lab students will investigate chromatography - pigment separation, and compounds;
- During a whole class presentation the groups will present their findings.

**Assessments:**
- Formative: Lab grading rubric;
- Summative: Group Presentations and presentation grading rubric.

**Materials:**
- General lab equipment;
- Curricular handouts.

**Instruction:**
- During a small group lab the teacher will assist groups in testing their ideas;
- During group presentations the teacher will evaluate student understanding to determine what re-teaching needs the students have.
**Day 3**

**Learner Outcomes**
- During a Pre-Reading and discussion, students will develop an understanding of molecules and compounds;
- The Pre-Reading exercise will give students background information to understand chemical bonding and the types of bonds;
- During the Pre-Reading students will be introduced to the idea that compounds have properties that are different from their constituent elements;
- Students will present in seminar format their understanding of the reading;
- Students will practice identifying elements in molecules from the periodic table.

**Assessments:**
- Formative: The teacher will observe and assist student’s understanding of bonding, molecules and using the periodic table.

**Materials:**
- Curricular Handouts

**Instruction**
- Teacher will introduce the readings;
- Teacher will observe student understanding as they present understanding of parts of the reading;
- Teacher will guide the In-class Practice
Day 4

Learner Outcomes:
• During a laboratory students will investigate the characteristics of molecules and bonding.

Assessments:
• Formative: Lab Grading Rubric

Materials:
• Curricular handouts
• Standard lab equipment

Instruction:
• Teacher will assist students with the lab procedure;
• Teacher will assess student understanding using the Lab Grading Rubric.
Day 5

Learner Outcomes:
• During computer aided practice students will develop their understanding of molecules and bonding.

Assessments:
• Graded Lab Reflection Sheet

Materials:
• Curricular handouts
• Computers

Instruction:
• Teacher will assist students in developing their understanding of molecules and bonding and interpreting data.
Content Standards

As a basis for understanding the concepts:

National B.
- Students develop an understanding of the properties and changes of properties in matter including the evidence and the logical arguments that support the particulate model of matter;
- Substances react chemically in characteristic ways with other substances to form new substances (compounds) with different characteristic properties;
- Substances often are placed in categories or groups if they react in similar ways; metals is an example of such a group;
- A substance has characteristic properties, such as density, a boiling point, and solubility.

California 3.
- Students know the structure of the atom and know it is composed of protons, neutrons, and electrons.
- Students know that compounds are formed by combining two or more different elements and that compounds have properties that are different from their constituent elements;
- Students know how to use the periodic table to identify elements in compounds;

California 7.
- Students know how to identify regions corresponding to metals, nonmetals, and inert gases.
- Students know each element has a specific number of protons in the nucleus (the atomic number) and each isotope of the element has a different but specific number of neutrons in the nucleus.
- Students know substances can be classified by their properties, including their melting temperature, density, hardness, thermal and electrical conductivity.
Day 1

Learner Outcomes:
• During a pre-reading activity students will gain an understanding of how variations in the number of neutrons results in isotopes;
• During a pre-reading activity students will begin to understand half-life, radioactive decay and radiation.

Assessments:
• Formative: Note-Taking Guide

Materials:
• Curricular handouts
• Raisins and cups
• Computer and projector

Instruction:
• Instructor will guide the pre-reading and note-taking;
• Instructor will direct the “Get a Half-Life” activity;
• Instructor will describe and assist with the Isotope Presentation activity.
Day 2

Learner Outcomes:
• During an in-class activity and homework assignment students will develop their understanding of isotopes;
• During an in-class activity and homework assignment students will prepare a presentation on specific isotopes;

Assessments:
• During an in-class presentation student’s will demonstrate their understanding of isotopes.
• Formative: Student note-taking

Materials:
• Curricular handouts
• Raisins and cups
• Computer and projector

Instruction:
• The teacher will guide student research on their isotopes;
• Teacher will evaluate student notes;
• Teacher will evaluate presentations using the presentation rubric.
Day 3

**Learner Outcomes:**
- During exam practice, working in pairs students solidify their understanding of the structure of the atom, using the periodic table, isotopes, half-life and radiation;
- During student review presentations students demonstrate their understanding of the structure of the atom, using the periodic table, isotopes, half-life and radiation;
- During a teacher directed review students will ask questions to clarify their understanding of the structure of the atom, using the periodic table, isotopes, half-life and radiation;

**Assessments:**
- Discussion rubric

**Materials:**
- Curricular handouts
- Completed homework assignments
- Class notes
- Memory cards

**Instruction:**
- The teacher will evaluate the class understanding of the material and provide additional instruction as needed.
Day 4

Learner Outcomes:
- During exam practice, working in pairs students solidify their understanding of the structure of the atom, using the periodic table, isotopes, half-life and radiation;
- During student review presentations students demonstrate their understanding of the structure of the atom, using the periodic table, isotopes, half-life and radiation;
- During a teacher directed review students will ask questions to clarify their understanding of the structure of the atom, using the periodic table, isotopes, half-life and radiation;

Assessments:
- Discussion rubric

Materials:
- Curricular handouts
- Completed homework assignments
- Class notes
- Memory cards

Instruction:
- The teacher will evaluate the class understanding of the material and provide additional instruction as needed.


**Day 5**

**Learner Outcomes:**
- During a summative Unit I exam students will demonstrate their understanding and knowledge of the structure of the atom, using the periodic table, isotopes, half-life and radiation;

**Assessments:**
- Summative Unit I exam

**Materials:**
- Test materials

**Instruction:**
- The teacher will provide assistance to students during the exam.