

The Periodic Table

Chemistry Unit

Atlanta Public Schools

Unit Cover Page

Unit Title: **The Periodic Table**

Grade Levels: **10-12**

Subject/Topic Areas: **Chemistry/Periodic Table**

Time Frame: **3 Weeks**

Key Words: Periodic Law, group, period, representative element, transition element, metal, alkali metal, alkaline earth metal, transition metal, inner transition metal, nonmetal, halogen, noble gas, metalloid, diagonal relationships

Brief Summary of Unit (including curricular context and unit goals) :

The Periodic Table is used to organize elements by the number of protons available in the nucleus. It includes symbols for elements and atomic mass units. The table is organized so that elements that exhibit similar properties are grouped together. At the end of this unit, you will be able to use the table as a reference for all future studies in science. Brief attention will be paid to the history and development of the table.

Big Idea :

The Periodic Table

Stage 1 – Identify Desired Results

Standard and elements:

SC4: Students will use the organization of the Periodic Table to predict properties of elements.

- Use the Periodic Table to predict periodic trends including atomic radii, ionic radii, ionization energy, and electronegativity of various elements.
- Compare and contrast trends in the chemical and physical properties of elements and their placement on the Periodic Table.

Related Content Standards:

SCSh2: Students will use standard safety practices for all classroom laboratory and field investigations.

- Follow correct procedures for use of scientific apparatus.
- Demonstrate appropriate techniques for all laboratory situations.
- Follow correct protocol for identifying and reporting safety problems and violations.

SCSh3: Students will identify and investigate problems scientifically.

- Suggest reasonable hypotheses for identified problems.
- Develop procedures for solving scientific problems
- Collect, organize and record appropriate data.
- Develop reasonable conclusions based on data collected.
- Evaluate whether conclusions are reasonable by reviewing the process and checking against other available information.

SCSh6: Students will communicate scientific investigations and information clearly.

- Write clear, coherent laboratory reports related to scientific investigations.
- Write clear, coherent accounts of current scientific issues, including possible alternative interpretations of the data.
- Use data as evidence to support scientific arguments and claims in written or oral presentations.
- Participate in group discussion of scientific investigation and current scientific issues.

SCSh7: Students will analyze how scientific knowledge is developed.

- Universal principles are discovered through observation and experimental verification.
- Hypotheses often cause scientists to develop new experiments that produce additional data.
- Testing, revising, and occasionally rejecting new and old theories never ends.

SCSh8: Students will understand important features of the process of scientific inquiry.

- a. Scientific investigators control the conditions of their experiments in order to produce valuable data.
- b. Scientific researchers are expected to critically assess the quality of data including possible sources of bias in the investigations' hypotheses, observations, data analyses, and interpretations.
- c. Scientists use practices such as peer review and publication to reinforce the integrity of scientific activity and reporting.
- d. The merit of a new theory is judged by how well scientific data are explained by the new theory.
- e. The ultimate goal of science is to develop an understanding of the natural universe, which is free of biases.
- f. Science disciplines and traditions differ from one another in what is studied, techniques used and outcomes sought.

SCSh9: Students will enhance reading in all curriculum areas by:

- c. Building vocabulary knowledge
 - *Demonstrate an understanding of contextual vocabulary in various subjects.
 - *Use content vocabulary in writing and speaking.
 - *Explore understanding of new words found in subject area texts.
- d. Establishing context:
 - *Explore life experiences related to subject area content.
 - *Discuss in both writing and speaking how certain words are subject area related.
 - *Determine strategies for finding content and contextual meaning for unknown words.

Connections to Other Disciplines

English/ Language Arts: ELA (9-11) W1, ELA (9-11) W3, ELA (9-11) W4,
ELA (9-11) C1, ELA (9-11) C2, ELA (9-11) SV1, ELA (9-11) SV2

Mathematics: MC1D1, MC1D2, MC1P4, MC1P5

Social Studies: SSUSH19, SSUSH21, SSWH9, SSHH10, SSWH16

Enduring Understandings :

- ❖ The Periodic Table may be used to find the symbol, atomic number and the atomic mass
- ❖ The relationship of the number of protons to the atomic number
- ❖ The arrangement of the periodic table into groups and periods
- ❖ Elements in the same group have similar properties
- ❖ The four blocks of the periodic table are related to electron configuration.
- ❖ The periodic table groups elements according to valence numbers

Essential Questions :

- ❖ Why do elements in the same group have similar properties?
- ❖ How are the group and period trends in the periodic table related to electron configuration?
- ❖ What is the significance of the s, p, d and f blocks on the periodic table?
- ❖ How are elements classified based on their electron configurations?
- ❖ What are the sources and uses of common elements?

The key knowledge will students acquire as a result of this unit:

The student will know how to:

- *Describe a group based on its properties
- *Relate the properties of a period to the electron configuration
- *Do valences based on s, p, d, and f blocks of the periodic table
- *Classify elements based on their electron configurations
- *Identify the sources and uses of selected elements

The key skills will students acquire as a result of this unit:

- ❖ Understand the organization and interpret data so that the periodic table may be used as a reference tool for all of Chemistry

Stage 2 – Determine Acceptable Evidence

What evidence will show that students understand (performance tasks)?

Working in small groups, use a chemistry resource materials to locate ionic radius, atomic radius, and ionization energies, for rows 2, 3, and 4. Organize the data into workable tables. Use appropriate software to graph each row. Evaluate similarities and differences of each row. Hypothesize reasons for the similarities and differences. Choose one specific property to present to the class.

Other Evidence (quizzes, tests, prompts, observations, dialogues, work samples):

1. Design of a power point presentation on each element
2. Quizzes about families and periods of elements
3. Minilab in which colors and patterns represent families and elements
4. Individual research on elements
5. Collection of photographs of element
6. Computing the mass of compounds using the periodic table
7. Building of compounds using the valences from the periodic table

Student Self-Assessment and Reflection:

Glencoe Chemistry: Chemistry: Matter and Changes (2002)

support materials contains many self-assessment opportunities including:

<http://www.glencoe.com/sec/science/chemistry/Chem/2002>

- ❖ Self-Assessment Quizzes, Worksheets and CHEMLAB on Publisher's Website
- ❖ Self-Assessment CD provided with textbook
- ❖ Journal incorporating reflection and writings about Periodic Table

Performance Task Blueprint

What understandings and goals will be assessed through this task?

Students will explain the organization of the periodic table

Students will build compounds using the periodic table

What criteria are implied in the standards and understandings regardless of the task specifics?
What qualities must student work demonstrate to signify that standards were met?

Implied–1) The Periodic Table is the most basic reference in Chemistry
2) Understanding its organization is essential

Qualities: Student use the periodic table to find symbols, atomic numbers and masses. The should also predict valences based on location of elements.

Through what authentic performance task will students demonstrate understanding?

Students will maintain journals where they will maintain a section for an element in each group of the periodic table. Photographs, sources and uses of the elements must be included. Appropriate references should also be provided.

What student products and performances will provide evidence of desired outcomes?

*Periodic Table Power Point Presentation
*Laboratory Reports
*Quizzes and Tests (Groups and Families of the Periodic Table)

*Journals
*Debate – Mendeelev’s organization
*Research paper

What student products and performances will provide evidence of desired outcomes?

*Journals
*Reports about elements
*Reflection Exercises

Stage 3 – Plan Learning Experiences and Instruction

Consider the WHERETO elements:

1. Hook → Students will be asked to explain the organization of their closets. They will they discuss a criteria for organizing chemicals. - **H**
2. Introduce the Essential Questions and discuss the culminating unit performance tasks. Students will maintain a journal throughout unit. - **W**
3. After being presented samples of metals, nonmetals and metalloids, students will be asked to identify the element and state its groups and characteristics after doing research. - **E**
4. Each student will be a box on the periodic table and will create a poster outlining chemical and physical properties. - **T**
5. Write an essay in which students will explain how Mendeleev predicted properties of elements before they were discovered. - **R**
6. Demonstration of Noble Gases using Tesla Tubes - **E**
7. Lab – determination of molar heats of fusion and vaporization in a period. - **R**
8. Demonstration – Chemical Reactivity occurs in predictable manner. - **E**
9. Lab – Descriptive Chemistry of Elements - **R**
10. Observation and written descriptions of magnets with various elements - **E**
11. Using a blank periodic table, valence electrons in each family will be identified. - **E**
12. Research how cesium ions may be used as fuel for ion engines. - **T**
13. Lab – Properties of Magnesium - **E**.
14. Presentation – students will present research on individual elements. - **E**
15. Speaker – discussion of the Band Theory and other orbital models. - **O**
16. Speaker – chemists will discuss individual research and careers. - **O**

W- Where the unit is headed; **H** – Hold Student Attention **E** – Equip with experience **R** – Rethink big ideas, Reflect on Progress, Revise; **E**- Evaluate progress and Access; **T**- Tailor to reflect individual talents; **O** – Organize for deep understanding

Resources

Glencoe Chemistry; Teacher Resources and Laboratory Manual; Carolina Biological Company

Web Resources-

1. <http://www.cytochemistry.net/Chemistry/Nucleus.htm>
2. <http://www.chemistry.org/>
3. [About.com](http://www.about.com)
4. [An Internet Resource for Teachers](#)
5. http://www.glavac.com/#_An_Internet_Resource

Cell Lab Materials-

1. Carolina Biological Supply Company
2. Ward's Science Supply
3. Sargeant Welch Scientific Supply

Expendables- various chemicals

Reference:

Georgia Department of Education High School GPS Sample Tasks and Learning Activities

Stage 3 –Plan Learning Experiences and Instruction

Consider the WHERETO elements?

Monday	Tuesday	Wednesday	Thursday	Friday
Hook → Students will be asked to explain the organization of their closets. They will they discuss a criteria for organizing chemicals	Introduce the Essential Questions and discuss the culminating unit performance tasks. Students will maintain a journal throughout unit.	After being presented samples of metals, nonmetals and metalloids, students will be asked to identify the element and state its groups and characteristics after doing research.	Each student will be a box on the periodic table and will create a poster outlining chemical and physical properties.	Write an essay in which students will explain how Mendeleev predicted properties of elements before they were discovered.
Demonstration of Noble Gases using Tesla Tubes	Lab – determination of molar heats of fusion and vaporization in a period	Demonstration – Chemical Reactivity occurs in predictable manner	Lab – Descriptive Chemistry of Elements	Observation and written descriptions of magnets with various elements. Using a blank periodic table, valence electrons in each family will be identified.
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