Lesson Title	Know Your Elements
Length of Lesson	90 minutes
Created By	Cheryl McLaurin
Subject	Chemistry
Grade Level	10^{th}-12^{th}
State Standards	9^{th}-12^{th} Chemistry 1a., 1g., 3b.
DOK Level	DOK 2, 3, 4
DOK Application	Analyze, Compare, Investigate, Organize, Construct, Collect and Display, Identify Patterns
National Standards	9-12^{th} A, B, D, F, G
Graduate Research Element	Natural Resources, GIS

Student Learning Goal:
Students will learn about the properties and uses of the less commonly encountered elements occurring on the periodic table and where those elements occur in the natural world.

State Standards for 9-12^{th} Chemistry

1.a) Use current technologies such as CD-ROM, DVD, Internet, and on-line data search to explore current research related to a specific topic. *Students will utilize on-line research methods to investigate elements and will be shown how to conduct discern academic/scholarly information sources from popular sources.*

1.g) Collect, analyze, and draw conclusions from data to create a formal presentation using available technology. *Students will be required to turn in a one to two page paper reporting their findings and give a two to three minute in-class presentation highlighting interesting facts about their assigned element and identifying a specific location where the element is found.*

3.b) Analyze patterns and trends in the organization of elements in the periodic table and compare their relationship to position in the periodic table. *Students will be required to research and report on the major chemical and physical properties of the assigned element.*

National Contents Standards 9-12

A: **Inquiry**: Formulate and revise scientific explanations and models using logic and evidence.

- Student inquires should culminate in formulating an explanation or model. Models should be physical, conceptual, and mathematical. In the process of answering the questions, the students should engage in discussions and arguments that result in the revision of their explanations. These discussions should be based on scientific knowledge, the use of logic, and evidence from their investigation.

B: **Physical Science**: Structure and Properties of Matter.

- An element is composed of a single type of atom. When elements are listed in order according to the number of protons, repeating patterns of physical and chemical properties identify families of elements with similar properties. This "Periodic Table" is a consequence of the repeating pattern of outermost electrons and their permitted energies.

D: **Earth and Space Science**: Geochemical Cycles.

- The earth is a system containing essentially a fixed amount of each stable chemical atom or element. Each element can exist in several different chemical reservoirs. Each element on earth moves among reservoirs in the solid earth, oceans, atmosphere, and organisms as part of geochemical cycles.

F: **Science in Personal and Social Perspectives**: Natural Resources.

- Human populations use resources in the environment in order to maintain and improve their existence. Natural resources have been and will continue to be used to maintain human populations.

G: **History and Nature of Science**: Historical Perspectives.

- The historical perspective of scientific explanations demonstrates how scientific knowledge changes by evolving over time, almost always building on earlier knowledge.

Materials Needed (supplies, hand-outs, resources):
Report requirements and a fill-in world map will be handed out. Students will need internet/library access. GoogleEarth and the Smartboard will be utilized in the classroom.

Lesson Performance Task/Assessment:
Students will be assigned homework to research an assigned element and a one to two page paper will be turned in that summarizes their research. The required information to be included is listed on the attached handout. Scholarly references will be explained and at least two will be required for the paper to be handed in. In class, students will give a short (two to three minutes) presentation, describing the highlights of their research and stating a major geographic location where the element is found. These locations will be compiled during the class presentations and displayed on GoogleEarth on the class smartboard. To aid class participation and attention, a handout with a world map displayed will be required to be filled in as other students present.

Lesson Relevance to Performance Task and Students:

Students will expand their knowledge of the periodic table and where elements occur on earth.

Anticipatory Set/Capture Interest:
A short discussion on blood diamonds and the colonial race for gold will set up talk about the economic importance of elements.

Guided Practice:
Students will be walked through the expectations of the paper and how to properly research their assigned element. After presentations are completed, students will be shown the compiled map of element sources, and a brief discussion of spatial trends will follow.

Independent Practice:
Students will conduct their research on their own and will be expected to write a paper summarizing their findings. They will also give a solo presentation.

Remediation and/or Enrichment:
IEP's will be supported.

Check(s) for Understanding:
Students may be asked to expound on a highlighted fact.
Students will be asked to follow along with their own map.
Students may be asked to describe something they found interesting about another student's assigned element.
Students will be asked to identify spatial patterns of element sources.

Closure:
Teacher-led class discussion about patterns within the periodic table and across the earth will be held.

Possible Alternate Subject Integrations:
Environmental Science: Identifying the forms of elements found within the natural world will be identified.

Geography: Element occurrences will be located and mapped.

History: Conflicts centered around natural resource access will be discussed.

Teacher Notes:
- GoogleEarth is a free download, but will show world-wide distribution easily.
- Paper expectations and grading rubric are attached.
- Fill-in map is attached.

Know Your Elements!

Paper Expectations and Grading Key

Students will need to be sure to include the following:

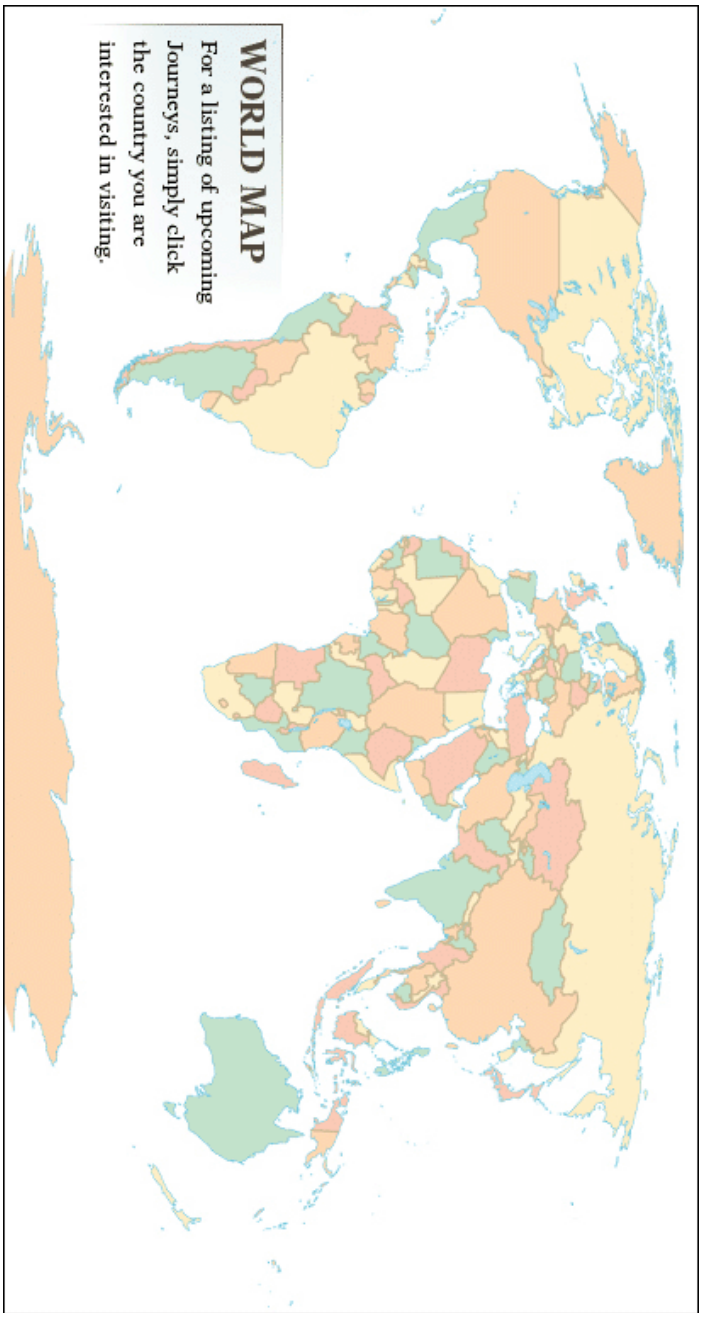
- Chemical Identifications:
  - Element name
  - Symbol
  - Period
  - Group
  - Atomic number
  - Atomic mass
- Chemical History
  - When it was discovered
  - Who discovered it
  - Where it was discovered
- Chemical Properties
  - Density
  - Metal/nonmetal
  - State at room temperature
  - Boiling and melting points
  - Specific heat
  - Crystalline structure
  - Electronegativity
  - Oxidation number
  - Electron configuration
  - Solubility
  - Isotopes
- Common Knowledge
  - Compounds
  - Allotropes
  - Uses
  - Hazards/toxicity
  - Radioactivity
- Geographic Information
  - Common mining sites
  - Abundance

This is not an exhaustive list, nor will all elements pertain to all bullet points (eg. crystalline structure). The more information included, the better your grade! At least two references will need to be identified, and these must be academic references. Plagiarism is not acceptable.

Please identify one element source accurately, by latitude/longitude or city, country.

Grading Key:

- Complete and correct facts – 50%
- Grammar and spelling – 20%
- Presentation – 15%
- In-class map – 10%
- Location – 5%


WORLD MAP
For a listing of upcoming
Journeys, simply click
the country you are
interested in visiting.