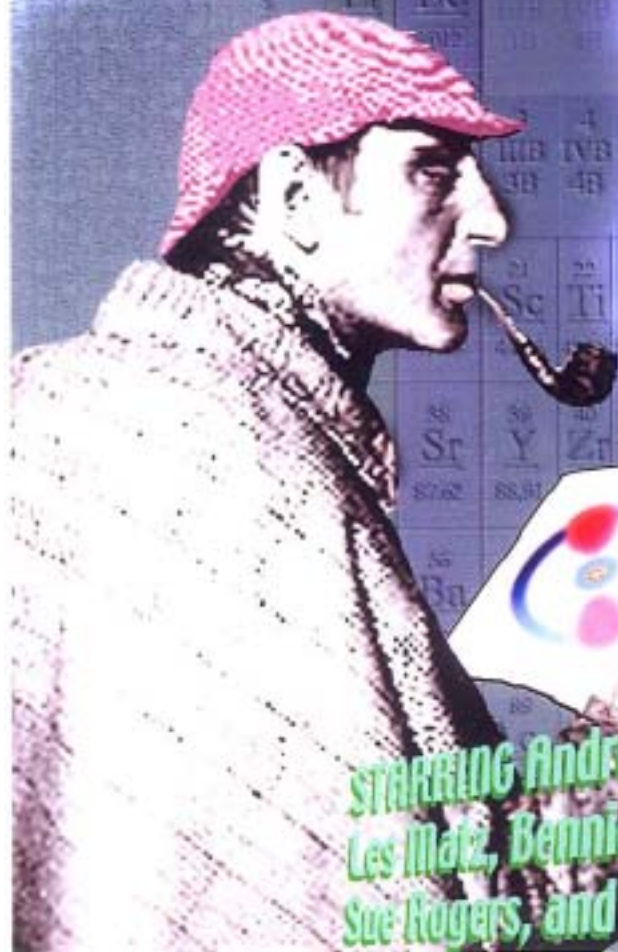


*The Mystery of the*  
**PERIODIC TABLE**

Is Elementary, my dear  
 Watson!



STARRING Andrea Evans, Jeff Kellef,  
 Les Matz, Bennie Ozoma, Lynn Palmquist,  
 Sue Rogers, and Rosanne Taylor Thornley

13	14	15	16	17	18
IIIA	IVA	VA	VIA	VIIA	VIIIA
3A	4A	5A	6A	7A	8A
15	14	15	16	17	2
IIIA	IVA	VA	VIA	VIIA	He
3A	4A	5A	6A	7A	4.003
5	6	7	8	9	10
B	C	N	O	F	Ne
10.81	12.01	14.01	16.00	19.00	20.18
8	9	10	11	12	
13	14	15	16	17	18
IIIA	IVA	VA	VIA	VIIA	VIIIA
3A	4A	5A	6A	7A	8A
21	22	23	24	25	26
Sc	Ti	V	Cr	Mn	Fe
44.96	47.88	50.94	52.00	54.94	55.85
86	88	91	92	93	94
Sc	Y	Zr	Nb	Mo	Tc
87.62	88.91	91.22	92.91	95.94	98.91
16	17	18	19	20	21
Ba	La	Ce	Pr	Nd	Pm
137.33	138.91	140.12	140.91	141.91	142.91
75	76	77	78	79	80
Re	Os	Ir	Pt	Au	Hg
186.21	190.23	192.22	195.08	196.97	200.59
81	82	83	84	85	86
Tl	Pb	Bi	Po	At	Rn
204.38	207.2	208.98	(209)	(210)	(222)
115	116	117	118		

## OVERVIEW

- I. **CONTENT:** (Why is this unit important? What are the essential concepts in this unit?)  
The essential concept of this unit is the Periodic Table of the Elements. The study of its organization and history leads to understanding of the elements based on their properties, reactivity pattern and electron structure.
- II. **PROCESS:** (How are the thinking skills developed?)  
Modeling, Inquiry based laboratory explorations, Recognition of trends, patterns and relationships, Application of these relationships leading to better understanding of real world chemistry
- III. **PRODUCT:** (What will kids do/know as a result of this unit?)  
Better understanding of the scientific method  
Demonstrate the relationship between the location of an element on the Periodic Table to its properties, real world uses and electronic structure  
Symbols matched to element name  
Periodic trends and common nomenclature

### Unit Overview: Alignment with National/State/District Pupil Performance Standards

- Benchmark 1: Mendeleev developed a prototype of the modern Periodic Table.
- Benchmark 2: Atomic structure determines placement on the table, reactivity and the properties of matter.
- Benchmark 3: Substances have characteristic chemical properties such as pH, density and reactivity.
- Benchmark 4: Minerals and rocks have worldwide use and economic importance.

### I-SEARCH INDEPENDENT RESEARCH PROJECTS FOR GIFTED AND TALENTED STUDENTS

1. **PARADOXES:**  
Imagine that in 1896, the United States Government closed the patent office stating that everything had already been discovered, at that time we had telegraph, piped gas and flush toilets. There was nothing new left to discover or invent. Research how Mendeleev was able to construct the Periodic Table in spite of this prevailing notion.  
Show the results of your search on a picture cube.
2. **ATTRIBUTES:**  
Choose 20 elements and find the origin of the name and symbol.  
Product: Prepare a display for students in the class.
3. **ANALOGIES:**  
Compare and contrast the Alkali metals to the Alkaline earth metals.  
Product: write a poem
4. **DISCREPANCIES:**  
How are synthetic elements made and what labs are currently doing the research?  
Research the cost and who is funding the research.  
Product: Present your findings in a press conference.
5. **PROVOCATIVE QUESTIONS:**

What would life be like if organic molecules were based on silicon instead of carbon?

Product: Create a mural.

6. **EXAMPLES OF CHANGE:**

Silicon is an extremely abundant element on the earth. Find its different locations and forms. Learn how it changes from one form to another.

Product: Database of your findings

7. **EXAMPLES OF HABIT:**

How can we change petrochemical dependence? In the recent past, a shortage of energy provoked increased drilling. As we deplete our fossil fuel reserves, we will ultimately need to find other sources of energy. Where should we look in the future?

Product: Create a survey of energy sources and uses: conduct the study.

8. **ORGANIZED RANDOM SEARCH:**

Design an element and describe what properties it would have and what applications you would use it for.

Product: A petition to the International Union of Pure and Applied Chemistry (I.U.P.A.C.) to recognize your element

9. **SKILLS OF SEARCH:**

Research the nature of plasma, the fourth state of matter.

Product: Give a puppet show to exhibit your findings.

10. **TOLERANCE FOR AMBIGUITY:**

What is space-time?

Product: a fact file

11. **INTUITIVE EXPRESSION:**

Democritus had a hunch that matter was made of atoms. What do you think led him to believe this and how was his idea different from Aristotle's.

Product: Deliver a soliloquy from Democritus explaining your ideas.

12. **ADJUSTMENT TO DEVELOPMENT:**

How was nitroglycerin developed? How did its inventors learn from their mistakes?

Product: Illustrate a comic strip describing the development of nitroglycerin and some of the experiences/ lessons learned by the scientists who worked on it.

13. **STUDY CREATIVE PEOPLE AND PROCESS:**

Choose a scientist whom you believe was very creative.

Product: Perform a skit that demonstrates the event that made that individual great and exhibits their creativity.

14. **EVALUATE SITUATIONS:**

Imagine a planet where ice is denser than liquid water.

Product: Illustrate a story to explain some of your thoughts.

15. **CREATIVE READING SKILL:**

Read the book *Nature's Building Block: An A-Z guide to the elements* by John Emsley.

Product: Write a reader's review of the book for Amazon.com.

16. **CREATIVE LISTENING SKILL:**

Learn the skill of generating ideas by listening.

Listen for information allowing one thing to lead to another.

17. **CREATIVE WRITING SKILL:**

Learn the skill of communicating ideas in writing.  
Learn the skill of generating ideas through writing.

18. **VISUALIZATION SKILL:**

Express ideas in visual forms.  
Illustrate thoughts and feelings.  
Describe experiences through illustrations.

**CRITICAL THINKING SKILLS – ACADEMIC  
ANALYZING HUMAN ACTIVITIES! (AHA!)**

STATE STANDARD # C7 Students will understand that major scientific breakthroughs may link large amounts of knowledge, build upon the contributions of many scientists and cross different lines of study. AK State Std. Geography A1, F1; Employability Std. B2

ESSENTIAL QUESTION: How does the Universal Theme of **Producing, Exchanging and Distributing** create mastery learning of essential concepts in this unit?

1. **PRODUCING, EXCHANGING, AND DISTRIBUTING** [ECONOMICS]

**KNOWLEDGE:**

**Anticipatory Set:** Sing the ELEMENT SONG by Tom Lehrer

**Students will:** locate the named elements from the song in the Periodic Table by symbol.

**COMPREHENSION:**

Identify by brainstorming what elements are economically valuable and where are they found in Alaska and around the world.

**APPLICATION:**

**Anticipatory Set:** *Diamonds are a Girl's Best Friend*, **James Bond** *Diamonds are Forever*

**Students will:** Research the recovery of diamonds, locations of mines, work conditions

**Class/team product:** Help wanted ad "Come work in my diamond mine"

**Multicultural and/or ESL and/or Bilingual Link:** Where are the DeBeer's Diamond Mines located and where is the diamond market? What drives the advertising and sales of diamonds?

**Mathematics/Science Link and/or Humanities Link:** Research the economics of mining.

**School-to-Career/Tech Prep Link:** Mining as an occupation

**HIGHER ORDER THINKING SKILLS (H.O.T.S.):**

**Anticipatory Set:** Movie clip *Death Hunt* with Charles Bronson or *White Fang* showing trading gold for food

**Students will:** Identify an element that is mined or harvested.

**Class/team/individual product:** Produce a world map with a legend showing locations of mines and the locations of the economic markets for the products. Student will predict the economic status of the communities at these different locations based on their findings.

**INDIVIDUAL JOURNAL ASSIGNMENT:**

Reaction to coal mine rescue July 2002

**HOMELINK:**

Can you find someone who worked in a mine during their life to find out what it was like?

Book: *Frozen Lady* by Susie Arnot

ESSENTIAL QUESTION: How does the Universal Theme of **Transportation** create mastery learning of essential concepts in this unit?

## 2. TRANSPORTATION

### KNOWLEDGE:

**Anticipatory Set:** clip from *Space 1999* with Martin Landau; the scene where the moon leaves orbit  
**Students will:** Identify the Radioactive Elements, their uses and disposal problems.

### COMPREHENSION:

Summarize current or possible disposal techniques of radioactive waste.

### APPLICATION:

**Anticipatory Set:** Half-Life Lab experience to collect data exhibiting exponential decay. (M&M Lab)

**Students will:** Perform lab

**Class/team product:** Each lab group will graph of their data. Using their graph, they will predict the length of time necessary for the decay of given amounts of uranium.

**Multicultural and/or ESL and/or Bilingual Link:** What has occurred to the Native population around Yucca Mountain? Can find the location of Yucca Mountain and surrounding reservation on a map.

**Mathematics/Science Link and/or Humanities Link:** What happened during the testing of Alaska natives with radioactive iodine and what were the repercussions?

**School-to-Career/Tech Prep Link:** Speaker with career in Nuclear Medicine and cancer treatment.

### HIGHER ORDER THINKING SKILLS (H.O.T.S.):

**Anticipatory set:** Nuclear café clip, Simpson's clip in the nuclear power plant, or China syndrome

**Students will:** Present emergency preparedness plan for an Arizona community along transport route to Yucca Mountain

**Class/team/individual product:** You will do the emergency broadcast on the radio or television in the event of a radioactive leak.

### INDIVIDUAL JOURNAL ASSIGNMENT:

Response to an emergency broadcast announcement.

### HOMELINK:

Talk to someone who was involved in nuclear safety drills when they were young.

Are there any radioactive elements in your home?

Alaska State Standards Science D2, Language Arts A2, A5, B1, B2, C2, Technology A2, Government C7

ESSENTIAL QUESTION: How does the Universal Theme of **Communications** create mastery learning of essential concepts in this unit?

## 3. COMMUNICATIONS

### KNOWLEDGE:

**Anticipatory Set:** Verizon commercial

**Students will:** List elements used in communication technology.

### COMPREHENSION:

Compose a poem or song demonstrating how elements are used in communication.

### APPLICATION:

**Anticipatory Set:** Clip from *Back to the Future*

**Students will:** What would have happened if certain elements had not been discovered?

**Class/team product:** Write a fairy tale about an alternate future without one of those elements.

**Multicultural and/or ESL and/or Bilingual Link:** Examine how cultures without technology communicate.

**Mathematics/Science Link and/or Humanities Link:** Investigate pH and cell communication.

**School-to-Career/Tech Prep Link:** Invite a telecommunications specialist to explain the effect of solar flares on communications satellites.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

**Anticipatory set:** News clips of Whales and the U.S. Navy's new sonar communication.

**Students will:** Choose a position for or against this development by the Navy.

**Class/team/individual product:** Oral defense in class discussion/debate.

INDIVIDUAL JOURNAL ASSIGNMENT:

With the atomic number given to you, determine the period, group and properties of your element.

HOMELINK:

When was the first time someone at home remembers using e-mail to communicate?

Alaska State Std. Science A9, Language Arts A4, A5, Government C7

ESSENTIAL QUESTION: How does the Universal Theme of **Protecting and Conserving** create mastery learning of essential concepts in this unit?

4. PROTECTING AND CONSERVING

KNOWLEDGE:

**Anticipatory Set:** Dump out the garbage collected in the classroom on the table.

**Students will:** Sort the garbage and identify recyclable items.

COMPREHENSION:

What do these items become? Students will investigate the life cycle of a product, showing their results on a concept map.

APPLICATION:

**Anticipatory Set:** Banana Slugs recycling song, John McCutcheon *One Man's Trash...*, Rounder Records

**Students will:** Recycle for a week in the classroom and at home.

**Class/team product:** Create a functional product with their recycled items.

**Multicultural and/or ESL and/or Bilingual Link:** Examine landfills in other countries.

**Mathematics/Science Link and/or Humanities Link:** Determine the amount of garbage that could be recycled in other classrooms based on the study of your own class's garbage.

**School-to-Career/Tech Prep Link:** Speaker from Municipal Waste Management about the recycling program.

Speaker from ALPAR, the Recycling Center or one of the small recycling companies locally.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

**Anticipatory set:** Description of local recycling effort.

**Students will:** Research the data on recycling in Anchorage, Alaska

**Class/team/individual product:** Write an editorial to the paper on the feasibility of recycling more in Anchorage.

INDIVIDUAL JOURNAL ASSIGNMENT:

What is your position on recycling? Support your idea.

HOMELINK:

Recycle at home for a week. Weigh your garbage. Make a pie chart of your results.

STATE STANDARD Language Arts A6, A7, Technology A2

ESSENTIAL QUESTION: How does the Universal Theme of **Providing Education** create mastery learning of essential concepts in this unit?

5. PROVIDING EDUCATION

KNOWLEDGE:

**Anticipatory Set:** clip of what makes a good teacher from Roger Taylor or any of the films on teaching.

**Students will:** Identify the components of a good lesson.

COMPREHENSION:

Write a lesson on an element, family or group. Practice on peers. Collect peer reviews and refine lesson.

APPLICATION:

**Anticipatory Set:** Each team will prepare an anticipatory set for their lesson.

**Students will:** Teach their lesson to an elementary class.

**Class/team product:** Individual demonstration or hands on learning activity.

**Multicultural and/or ESL and/or Bilingual Link:** Address the cultural needs of your bilingual students.

**Mathematics/Science Link and/or Humanities Link:** What is your responsibility as a teacher in our community?

**School-to-Career/Tech Prep Link:** Videotape or digitally record your lesson.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

**Anticipatory set:** Clip from Helen Keller *Miracle Worker*

**Students will:** Revise your lesson to accommodate special needs such as a physical disability or gifted learners.

**Class/team/individual product:** Make revisions to your lesson.

INDIVIDUAL JOURNAL ASSIGNMENT:

Self-evaluation on what you did well.

HOMELINK:

Discuss your experience with your family.

STATE STANDARD Science A1, B1, B2, Technology C2, Employability B2

ESSENTIAL QUESTION: How does the Universal Theme of **Making and Using Tools and/or Technology** create mastery learning of essential concepts in this unit?

6. MAKING AND USING TOOLS AND/OR TECHNOLOGY

KNOWLEDGE:

**Anticipatory Set:** *2001: Space Odyssey* clip from the beginning.

**Students will:** List tools used in the past compared to tools used today. Learn the names of common chemistry tools.

COMPREHENSION:

How do we use tools to distinguish between compounds, elements and mixtures?

APPLICATION:

**Anticipatory Set:** Copper/ silver nitrate demo.

**Students will:** Perform separation lab.

**Class/team product:** Lab Report

**Multicultural and/or ESL and/or Bilingual Link:** Profile a scientist who developed one of these tools. Write a jingle.

**Mathematics/Science Link and/or Humanities Link:** Hypothesize the uses for various mystery tools demonstrated by the teacher.

**School-to-Career/Tech Prep Link:** Speaker from the Crime Lab

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

**Anticipatory set:** Magic School bus at the waterworks

**Students will:** Perform a water reclamation lab

**Class/team/individual product:** The best tasting water wins. (The teacher is the taste tester after each team tries its own water.)

INDIVIDUAL JOURNAL ASSIGNMENT:

Show the apple demo about how much water on the planet is potable.

Reflect on how you use water in your daily life.

HOMELINK:

Find out where your water comes from.

STATE STANDARD Science A9, B1, B2 Culture B1, B2, Art B1, B2, Language arts C1, C2, C5

ESSENTIAL QUESTION: How does the Universal Theme of **Providing Recreation** create mastery learning of essential concepts in this unit?

7. PROVIDING RECREATION

KNOWLEDGE:

**Anticipatory Set:** Read portion of Jack London's *to Build a Fire* where the snow falls and puts out his fire.

**Students will:** Participate in a cold stuff investigation: what substance makes the best insulator? Research which organic molecules act most like a down coat.

COMPREHENSION:

Students make one of two slogans, choosing either of the following statements. 1. Explain the difference between convection, radiation and conduction 2. Explain the difference between carbohydrate, lipids, proteins and nucleic acids.

APPLICATION:

**Anticipatory Set:** clip from *Never Cry Wolf*, when the scientist gets dropped off.

**Students will:** Prepare a detailed illustration explaining their glove's construction.

**Class/team product:** Testing gloves for insulating capacity.

**Multicultural and/or ESL and/or Bilingual Link:** Students compare different styles of dress of Alaskan native groups and indicate insulating qualities of the materials used.

**Mathematics/Science Link and/or Humanities Link:** Look at the history of fur trade in Alaska.

**School-to-Career/Tech Prep Link:** GIS global mapping

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

**Anticipatory set:** Clip from *Cool Runnings* where they compare the old sled with the new ones.

**Students will:** Create a storyboard that explains how a change in technology made for a change in a recreational tool.

**Class/team/individual product:** Storyboard

INDIVIDUAL JOURNAL ASSIGNMENT:

Write about the feature of your glove about which you are most proud.

HOMELINK:

Analyze gloves at home to see which the best insulators are.

STATE STANDARD Science B6, D5, Language Arts B1, Government F1, G3

ESSENTIAL QUESTION: How does the Universal Theme of **Organizing and Governing** create mastery learning of essential concepts in this unit?

8. **ORGANIZING AND GOVERNING**

KNOWLEDGE:

**Anticipatory Set:** clip from *A Beautiful Mind* where Ed Harris is telling Crowe what to do.

**Students will:** Review MSDS Sheets for 10 chemicals. Arrange them from most to least hazardous.

COMPREHENSION:

Students summarize lab safety rules after watching safety rules video. Put on skits to exhibit the rules.

APPLICATION:

**Anticipatory Set:** Read article *Dihydrogen monoxide*.

**Students will:** Produce their own MSDS sheet for the most dangerous chemical known to man

**Class/team product:** MSDS sheet

**Multicultural and/or ESL and/or Bilingual Link:** Translate your MSDS sheet to another language or investigate how another country regulates chemicals.

**Mathematics/Science Link and/or Humanities Link:** Find what percent of chemicals are classified as hazardous.

**School-to-Career/Tech Prep Link:** Investigate what an OSHA worker does and what the qualifications are.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

**Anticipatory set:** Erin Brockovitch

**Students will:** Identify the hazardous materials that are dumped in waters of Alaska by the cruise ship industry.

**Class/team/individual product:** Timeline indicating how regulations and enforcement have changed.

INDIVIDUAL JOURNAL ASSIGNMENT:

Do you think that you are exposed to high levels of hazardous materials?

HOMELINK:

Ask family members if they were ever exposed to chemicals that are now classified as hazardous.

STATE STANDARD Science A2, C4, D1, D2, Employability B2, Technology E6, E7

ESSENTIAL QUESTION: How does the Universal Theme of **Moral, Ethical and Spiritual Behavior** create mastery learning of essential concepts in this unit?

9. **MORAL, ETHICAL AND SPIRITUAL BEHAVIOR**

KNOWLEDGE:

**Anticipatory Set:** Read article on Shroud of Turin or watch the Discover video on this topic.

**Students will:** Outline the issues involved in the carbon-14 dating of the Shroud of Turin.

COMPREHENSION:

Students will explain the use of science to understand religious truths.

APPLICATION:

**Anticipatory Set:** clip from *Flatliners*, where they die and see the light

**Students will:** Discover the chemical reactions involved in dying which lead to seeing light at the moment of death.

**Class/team product:** Pamphlet showing results.

**Multicultural and/or ESL and/or Bilingual Link:** Investigate rituals surrounding death in other countries or watch Bill Moyer's series

**Mathematics/Science Link and/or Humanities Link:** Investigate the nature of light according to Einstein.

**School-to-Career/Tech Prep Link:** Mortician as a speaker

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

**Anticipatory set:** clip of Sean Penn in *Dead Man Walking*

**Students will:** Summarize the process and chemicals used in lethal injection of inmates.

**Class/team/individual product:** Diary entry of a person about to be put to death or the person witnessing the execution.

INDIVIDUAL JOURNAL ASSIGNMENT:

In the event of your death, what would you choose for a final disposition of your body?

HOMELINK:

Discuss after death arrangements with your family.

STATE STANDARD Science D1, D2, D6, Art A1, A3, B2, B3, Employability B1, B2

ESSENTIAL QUESTION: How does the Universal Theme of Aesthetic Needs create mastery learning of essential concepts in this unit?

10. AESTHETIC NEEDS

KNOWLEDGE:

**Anticipatory Set:** clip of volcano blowing and magma is flowing.

**Students will** know pottery is made from the same materials as igneous rock. Glaze is melted glass. Students will understand that ceramic materials have great variety.

COMPREHENSION:

Students will distinguish between the colors of ceramics and the elements responsible for each color.

APPLICATION:

**Anticipatory Set:** clip from *Ghost* with Demi Moore at the wheel

**Students will:** Produce test tiles of different colors by doing a simple line blend of different elements.

**Class/team product:** Test tiles

**Multicultural and/or ESL and/or Bilingual Link:** Read about pottery from Mexico, China, Japan, Greece and England.

**Mathematics/Science Link and/or Humanities Link:** Read about Japan's Tea Ceremony

**School-to-Career/Tech Prep Link:** Potter as speaker

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

**Anticipatory set:** Show examples of Raku Pottery

**Students will:** do a Raku firing

**Class/team/individual product:** Fired object

INDIVIDUAL JOURNAL ASSIGNMENT:

Write about the results of your experiment in pottery.

HOMELINK:

Take your pottery home and show it to your family. Tell them how you made it.

STATE STANDARD Science A1, B5, C3, History A1

11. **History of Development of the Periodic Table**

KNOWLEDGE:

**Anticipatory Set:** Mad Scientist clip: Pink Panther Strikes again

**Students will:** Design a stamp for one of the different scientists involved in solving the puzzle of the Periodic Table.

COMPREHENSION:

Distinguish between different tactics taken to solve the puzzle.

APPLICATION:

Changes, computes, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.

**Anticipatory Set:** clip of scam artist, *48 Hours*

**Students will:** Jigsaw 5 discoveries associated with the Periodic Table and decide who should get the credit.

**Class/team product:** News article announcing the discovery

**Multicultural and/or ESL and/or Bilingual Link:** Find out the Nationalities of the researchers involved.

**Mathematics/Science Link and/or Humanities Link:** During the Age of Enlightenment, what other scientific advancements were being made?

**School-to-Career/Tech Prep Link:** Entrepreneurship, how to proceed

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

**Anticipatory set:** clip *Blues Brothers* RESPECT from Aretha Franklin

**Students will:** Identify the repeating patterns in different Periodic Tables

**Class/team/individual product:** Make a crossword of terms used to describe the tables.

INDIVIDUAL JOURNAL ASSIGNMENT:

Look for patterns in your home.

HOMELINK:

Look for cycles and patterns in the music, history, language arts or mathematics that you are studying now.

STATE STANDARD Science B1, C2, C5, Language Arts B2, D4

12. **Organization of the Table**

KNOWLEDGE:

**Anticipatory Set:** Demo group I and group II elements reacting with water.

**Students will:** describe the observed properties of the group I and group II elements.

COMPREHENSION:

Be able to name the common families and explain why elements within a family have similar properties.

APPLICATION:

**Anticipatory Set:** clip *Good Will Hunting*, solving the problem

**Students will:** solve and complete a periodic table puzzle using clues about elements within each group. Students discover how Mendeleev fit missing elements into his table based on similar properties.

**Class/team product:** completed periodic table puzzle

**Multicultural and/or ESL and/or Bilingual Link:** Students investigate Mendeleev's original periodic table and note the use of the original Russian.

**Mathematics/Science Link and/or Humanities Link:** First Nobel Prizes given for work on the modern table

**School-to-Career/Tech Prep Link:** Investigate possible chemistry careers

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

**Anticipatory set:** clip of Periodic Table video, portion with Seaborgium

**Students will:** Each team will design its own Mendeleev castle that gives clues for various rooms that contain the elements 1-20. Puzzles will be distributed and played by other teams.

**Class/team/individual product:** Mendeleev castle

INDIVIDUAL JOURNAL ASSIGNMENT:

How important was Mendeleev? How would things have been different if he had not been born?

HOMELINK:

Teach your family about the design of the periodic table.

STATE STANDARD Science A1, A2, B1, Employability B1, B2

13. Trends of the Periodic Table

KNOWLEDGE:

**Anticipatory Set:** The Hindenberg Disaster clip, Balloons of Noble gases from *Elements organized*

**Students will:** summarize the pattern of the density of the Noble gases from the clip, comparing atomic numbers, valence electrons and reactivity patterns.

COMPREHENSION:

Diagram the electron configuration for two groups of elements and identify the patterns seen.

APPLICATION:

**Anticipatory Set:** Simple reaction demo

**Students will:** Reconstruct a cut up periodic table using the patterns observed from the previous exercise

**Class/team product:** Completed table

**Multicultural and/or ESL and/or Bilingual Link:** Report on one scientist who discovered an element.

**Mathematics/Science Link and/or Humanities Link:** Count the number of elements used to compose organic compounds.

**School-to-Career/Tech Prep Link:** Invite a Food chemist to speak.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

**Anticipatory set:** clip *Back to the Future*

**Students will:** Based on the trends discovered by examination of the Periodic Table, justify the ionization pattern of different groups.

**Class/team/individual product:** Diagram the ions of the main groups and their charges.

INDIVIDUAL JOURNAL ASSIGNMENT:

How do the organic elements you eat make up your body?

HOMELINK:

Find three things at home and try to determine the elements that compose the objects.

STATE STANDARD Science B1, Language Arts B1, D2, History B1

14. **Properties of metals and nonmetals**

KNOWLEDGE:

**Anticipatory Set:** *We are Family* Song

**Students will** identify metals, nonmetals, and metalloids after testing several examples of elements for their reactivity with water, electrical conductivity, melting point and malleability.

COMPREHENSION:

Students will summarize the properties of metals vs. nonmetals in a table.

APPLICATION:

**Anticipatory Set:** Show three unknown samples to students for their examination.

**Students will:** compare and contrast the observed properties of the samples.

**Class/team product:** Venn diagram

**Multicultural and/or ESL and/or Bilingual Link:** Look at the role of Iron through history.

**Mathematics/Science Link and/or Humanities Link:** Research the Mercury poisoning that occurred in Japan in the 1950's. OR Look at the history of copper in minting money. (US pennies)

**School-to-Career/Tech Prep Link:** Watch a video on glassmaking

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

**Anticipatory set:** Read aloud a Medical Mystery

**Students will:** SOLVE A MEDICAL MYSTERY looking at the theft of old gold fillings and the death of the dental lab tech!

**Class/team/individual product:** Illustrate a comic strip showing their deductions.

INDIVIDUAL JOURNAL ASSIGNMENT:

Which are more useful to you, metals or nonmetals?

HOMELINK:

Read about Bear Valley Elementary water supply and possible heavy metal contamination. Discuss solutions with your family.

STATE STANDARD Science A1, C7 Math A3, Language Arts B3

ESSENTIAL QUESTION: How do the states of matter relate to mastery learning of the Periodic Table?

15. **States of Matter**

KNOWLEDGE:

**Anticipatory Set:** Demo that shows examples of solid, liquid and gas.

**Students will:** locate these elements on the periodic table and show the locations of the different states of matter.

COMPREHENSION:

Generalize a trend of states of matter across the table.

APPLICATION:

**Anticipatory Set:** Demo triple point of carbon dioxide

**Students will:** design a method to change the state of an element.

**Class/team product:** Write results in Lab Report format

**Multicultural and/or ESL and/or Bilingual Link:** Read the story *Midas Touch*

**Mathematics/Science Link and/or Humanities Link:** Practice temperature conversions from Fahrenheit to Celsius to Kelvin

**School-to-Career/Tech Prep Link:** Find out more about how gold is refined with mercury.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

**Anticipatory set:** song *Should I stay or should I Go?*

**Students will:** write a fantasy story about an atom of an element that changes state

**Class/team/individual product:** Story

INDIVIDUAL JOURNAL ASSIGNMENT:

Write about the different ways to extinguish a fire.

HOMELINK:

Check your house for fire safety.

STATE STANDARD Science A9, A10, D3, Employability B1, B2, Culture B1, C4, E6, E7

ESSENTIAL QUESTION: How does the discipline/sub-discipline of Organic Chemistry relate to mastery learning of the Periodic Table?

16. **Chemistry of Life**

KNOWLEDGE:

**Anticipatory Set:** Set table with objects (some food, plants, wood, volunteer)

**Students will:** State what these objects have in common with regard to the periodic table

COMPREHENSION:

Locate on the periodic table the primary elements in organic compounds. Summarize this information in a skit revealing the element's address.

APPLICATION:

**Anticipatory Set:** clip from *Weird Science*: where they invent the girl

**Students will:** Given simple formulas, build organic molecules using clay

**Class/team product:** clay models of Organic molecules

**Multicultural and/or ESL and/or Bilingual Link:** Have the students bring in cultural food items.

**Mathematics/Science Link and/or Humanities Link:** Compare the content of fats, carbohydrates and proteins in the diet of a variety of cultures.

**School-to-Career/Tech Prep Link:** Registered Dietician as speaker

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

**Anticipatory set:** clip *Lorenzo's Oil*

**Students will:** Research or read about rapeseed oil in diets and how it impacts physiology.

**Class/team/individual product** Write a new law that would allow use of this oil in the treatment of Adrenoleukodystrophy (ALD) patients.

INDIVIDUAL JOURNAL ASSIGNMENT:

Read the label of a food you regularly consume and list the elements you may have eaten.

HOMELINK:

Discuss the four main food compounds and tell your family in which foods they are found.

STATE STANDARD Science C3, C6, D3, Language Arts D4, Culture E1, Employability B1, B2

ESSENTIAL QUESTION: How does the discipline/sub-discipline of Application of Technology relate to mastery learning of the Periodic Table?

17. **Applications and Uses**

**KNOWLEDGE:**

**Anticipatory Set:** Clip from the Medicine Man (the spectrograph)

**Students will:** match the spectrographs with the corresponding elements

**COMPREHENSION:**

Explain how Mass spectroscopy is used to identify the elements in compounds.

**APPLICATION:**

**Anticipatory Set:** clip Star Trek episode: Kirk fights the Gorgan

**Students will:** examine the history of explosives.

**Class/team product:** a bumper sticker for a non-lethal use of explosives.

**Multicultural and/or ESL and/or Bilingual Link:** How did the Chinese develop and use fireworks.

**Mathematics/Science Link and/or Humanities Link:** Recite the Star Spangled Banner relating the chemistry connection to the lyrics.

**School-to-Career/Tech Prep Link:** How would you get a certification to be a pyrotechnical?

**HIGHER ORDER THINKING SKILLS (H.O.T.S.):**

**Anticipatory set:** Video: Nova Fireworks

**Students will:** point out the elements and compounds that produce the colors in the fireworks.

**Class/team/individual product:** a collage that shows multiple uses of an element or compound

**INDIVIDUAL JOURNAL ASSIGNMENT:**

Describe the last time you saw a good fireworks display.

**HOMELINK:**

Where did you see the best fireworks ever?

**MORAL/ETHICAL/SPIRITUAL  
REASONING AND DILEMMAS**

**TEN ETHICAL DILEMMAS**

*(Must be set in context of unit, but must also relate to the lives of today's students)*

ESSENTIAL QUESTION: How does the content of this unit reflect **character education** through Moral and Ethical dilemmas?

1. **Producing, Exchanging, and Distributing** [Economics]

ESSENTIAL QUESTION: How does the **Human Activity** of **Producing, Exchanging and Distributing** create moral/ethical dilemmas?

**DILEMMA:**

Your significant other gives you a diamond ring. You recently read that most diamonds come from South Africa where workers do not have the same working conditions as those in the US. Based on this information, do you accept the ring or return it?

2. **Transportation**

ESSENTIAL QUESTION: How does the **Human Activity** of **Transportation** create moral/ethical dilemmas?

**DILEMMA:**

You live in a small community in Alaska that has an opportunity to accept nuclear waste for a considerable amount of money. Your community needs the money and would benefit greatly. Do you want your community to accept it?

3. **Communications**

ESSENTIAL QUESTION: How does the **Human Activity** of **Communications** create moral/ethical dilemmas?

**DILEMMA:**

The U.S. Navy installed communication equipment in Cook Inlet that will greatly improve our defenses. An abnormally high number of belugas begin washing up on shore shortly after the equipment begins testing. What should be done?

4. **Protecting and Conserving**

ESSENTIAL QUESTION: How does the **Human Activity** of **Protecting and Conserving** create moral/ethical dilemmas?

**DILEMMA:**

An initiative is on the ballot to mandate a deposit on all recyclable bottles. It has been voted down by the Legislature three times previously due mainly to pressure from the beverage industry. The companies claim it will cost them too much money and there is an abundance of landfill space in Alaska. The companies worry they will have to layoff employees. Your family has two people who work for the local Coca-Cola production plant. Would you support this bill?

5. **Providing Education**

ESSENTIAL QUESTION: How does the **Human Activity** of **Providing Education** create moral/ethical dilemmas?

**DILEMMA:**

You are driving your Grandparents' car with a handicapped-parking permit. You are in a hurry and it just snowed 2 feet. The parking lot has not been plowed. Do you park in the handicapped spot or in the deep snow at the back of the lot?

6. **Making and Using Tools and/or Technology**

ESSENTIAL QUESTION: How does the **Human Activity** of **Making and Using Tools and/or Technology** create moral/ethical dilemmas?

**DILEMMA:**

Your family has a cabin on the Kenai. You can run right down to your favorite fishing spot, but you notice the trail is becoming severely eroded at the bank this year. From biology class, you learned that this erosion is impacting the spawning salmon. Do you continue on the trail to your favorite spot or go the long way back to the new boardwalk with the tourists?

7. **Providing Recreation**

ESSENTIAL QUESTION: How does the **Human Activity** of **Providing Recreation** create moral/ethical dilemmas?

**DILEMMA:**

The fifth best skier at school receives 2 free pairs of a new high-end ski that are vastly superior to his friend's skis. His friend is the number six skier on the team. Should he loan a pair of the fast skis to his friend and risk not making varsity or keep the skis to himself.

8. **Organizing and Governing**

ESSENTIAL QUESTION: How does the **Human Activity** of **Organizing and Governing** create moral/ethical dilemmas?

**DILEMMA:**

You live in Juneau where the cruise ship industry is a major part of your economy. You discover that the ships can dump sewage and waste off the coast. If they can't do this they will need to charge more to

customers, raising the costs and lowering the number of people taking cruises. This would mean less income at your parents' shop. How do you stand on this issue?

### 9. **Moral, Ethical and Spiritual Behavior**

ESSENTIAL QUESTION: How does the **Human Activity** of **Moral, Ethical and Spiritual Behavior** create moral/ethical dilemmas?

#### **DILEMMA:**

A friend of yours is killed as a victim of a violent crime. The person responsible has been sentenced to death by lethal injection. How do you feel about this issue? Should the criminal suffer as your friend did before dying?

### 10. **Aesthetic Needs**

ESSENTIAL QUESTION: How does the **Human Activity** of **Aesthetic Needs** create moral/ethical dilemmas?

#### **DILEMMA:**

You are a potter. You can make a great glaze for your pots that makes them very valuable. This means you stand to make a big profit! The glaze contains lead and you know that your pots can cause severe health problems if they are used for drinking or cooking. What should you do?

## **PRODUCTIVE THINKING SKILLS DIVERGENT/CREATIVE THINKING**

### 1. **BRAINSTORM MODEL**

#### A. BRAINSTORM ALL OF THE \_\_\_\_\_:

- AHA #1. The elements you know
- AHA #2. Possible uses for radioactivity
- AHA #3. Ways to communicate
- AHA #4. Ways to use old newsprint
- AHA #5. Ways to teach someone to tie a shoe
- AHA #6. Ways to use a spoon
- AHA #7. Ways to cool a bottle of pop

#### B. BRAINSTORM AS MANY \_\_\_\_\_ AS YOU CAN THINK OF.

- AHA #8. Lab accidents
- AHA #9. Ways to dispose of human remains
- AHA #10. Uses of ceramics
- AHA #11. Scientists
- AHA #12. Ways to organize the students in a classroom
- AHA #13. Fashion trends from history
- AHA #14. Metals and alloys

#### C. HOW MANY WAYS CAN YOU COME UP WITH TO \_\_\_\_\_?

- AHA #15. Defrost your windshield
- AHA #16. Tell if something is alive
- AHA #17. Investigate a crime scene
- Random Brainstorm number of chemicals in a cigarette

### 2. **VIEWPOINT MODEL (Human or Animate) (Use Cultural Literacy Terms)**

#### A. HOW WOULD money LOOK TO A (N) Neanderthal?

- AHA #1. Atomic bomb
- AHA #2. Money
- AHA #3. Cell phone
- AHA #4. Battery

Madame Curie  
caveman/Neanderthal  
Alexander Graham Bell  
Thoreau

AHA #5. Overhead projector  
AHA #6. Mass spectrometer  
AHA #7. Freeze dried food  
AHA #8. Oil spill

Pythagoras  
Mendeleev  
Shakleton  
sea otter

B. WHAT WOULD A \_\_\_\_\_ MEAN FROM THE VIEWPOINT OF A (N)\_\_\_\_\_?

AHA #9. Neutron	carbon 14
AHA #10. Clay pot	volcano
AHA #11. Letter	black square on a crossword
AHA #12. Valence electron	core electron
AHA #13. One more electron	chlorine atom
AHA #14. Sodium atom	fluorine atom
AHA #15. Iodine solid molecule	iodine vapor molecule
AHA #16. Carbon atom	stomach
AHA #17. Neon light	Humpy's bar and saloon

C. HOW WOULD Mendeleev VIEW THIS?

(Use one person from history here)

1. X-ray
2. Airplane
3. Spiral notebook
4. Pop can
5. VCR
6. Electric guitar

3. **INVOLVEMENT MODEL (Personification/Inanimate object brought to life)**

A. HOW WOULD YOU FEEL IF YOU WERE \_\_\_\_\_?

AHA #1. Gold ring  
AHA #2. Railroad tracks under a train carrying nuclear waste  
AHA #3. Cell phone  
AHA #4. Used tire  
AHA #5. Dry erase marker or chalk mark on the board  
AHA #6. Lemonade mix  
AHA #7. Cotton sock

B. IF YOU WERE A \_\_\_\_\_, WHAT WOULD YOU (SEE, TASTE, SMELL, FEEL, etc.)?

AHA #8. Hot plate, see  
AHA #9. Carbo-14 atom, feel  
AHA #10. Paint brush for glazes, smell  
AHA #11. Electron, see  
AHA #12. Pencil lead, smell  
AHA #13. Copper atom, taste  
AHA #14. Helium balloon, see

C. YOU ARE A \_\_\_\_\_. DESCRIBE HOW IT FEELS.

AHA #15. Liquid mercury  
AHA #16. Spaghetti noodle  
AHA #17. Test tube  
Random Involvement chemo drug about to be injected into a cancer patient

4. **CONSCIOUS SELF-DECEIT MODEL**

A. SUPPOSE \_\_\_\_\_ . WHAT \_\_\_\_\_ .

AHA #1. Gold came out of your faucet \_\_\_\_\_ would happen to its value  
AHA #2. Radioactive waste was launched into space and found by aliens, would they think of humans

AHA #3. Email was invented before the telephone	would the world be like
AHA #4. Trees were extinct	would we write on
AHA #5. There was no public education	would happen
AHA #6. Bunsen burner froze things	would a scientist do
AHA #7. Protein tasted as good as fat	you snack on
AHA #8. Garbage floated on earth	would it look like around here
AHA #9. Jesus meets Buddha	would they say to each other

B. YOU CAN \_\_\_\_\_ . WHAT \_\_\_\_\_ ?

AHA #10. Paint with your fingers	will you paint
AHA #11. Fly or be invisible	would you rather do?
AHA #12. Only make things with nonmetals	would you build your house with
AHA #13. See electrons	do they look like
AHA #14. Mint coins	would you put on the coin
AHA #15. Make yourself less dense than water	do you do
AHA #16. Have nine lives	time period would you live in
AHA #17. Taste individual elements	would peanut butter and jelly taste like

5. **FORCED ASSOCIATION MODEL (Use cultural literacy terms here)**

A. HOW IS \_\_\_\_\_ LIKE \_\_\_\_\_ ?

AHA #1. Diamond	kite
AHA #2. Radioactive element	shoe
AHA #3. Element	song
AHA #4. Hair	garbage
AHA #5. Student	CD
AHA #6. Filter paper	whale
AHA #7. Hat	feather

B. GET IDEAS FROM \_\_\_\_\_ TO IMPROVE \_\_\_\_\_ .

AHA #8. OSHA	your rope swing
AHA #9. Battery	your life
AHA #10. Kiln	dog house
AHA #11. Bart Simpson	generation of electricity
AHA #12. Rock	theory of relativity
AHA #13. Beehive	school
AHA #14. Teflon	secret service

C. I ONLY KNOW ABOUT \_\_\_\_\_ . EXPLAIN \_\_\_\_\_ TO ME.

AHA #15. Aurora borealis	fireworks
AHA #16. Twinkies	power bar
AHA #17. CDs	vinyl records

6. **REORGANIZATION/SYNECTICS MODEL**

A. WHAT WOULD HAPPEN IF \_\_\_\_\_ ?

AHA #1. Rare elements were common and common elements were rare
AHA #2. Radioactive elements turned you green
AHA #3. People could communicate by only using sonar
AHA #4. Plants didn't recycle oxygen
AHA #5. Students did not have arms
AHA #6. We stored sewage like nuclear waste
AHA #7. We had antigravity devices to improve sports in the US

B. SUPPOSE \_\_\_\_\_ (HAPPENED) WHAT WOULD BE THE CONSEQUENCES?

AHA #8. We felt pain when we littered

- AHA #9. The ozone disappeared
- AHA #10. There was no color
- AHA #11. Straight lines could not be made
- AHA #12. There were no building codes
- AHA #13. Atoms could not form ions
- AHA #14. Tooth fillings were nonmetals

C. WHAT WOULD HAPPEN IF THERE WERE NO \_\_\_\_\_ ?

- AHA #15. Changes in the state of matter
- AHA #16. Grains (oats, wheat etc.)
- AHA #17. Matches or lighters

### CULTURAL LITERACY

**Students must meaningfully use these terms to: (1) spell correctly, (2) use correctly in a sentence, and (3) use a metaphor. Use E.D. Hirsch's, *The Core Knowledge Series* (i.e. *What Your Third Grader Needs to Know*) and your textbooks.**

**1. Dates:**

- 1869
- 450 BC
- 1999

**2. Names:**

Acid	Equation	Metalloid
Alkaline	Ethics	Microprocessor
Alloy	Evaporation	Neutron
Aluminum	Family	Nonmetal
Amino acids	Friable	Non-recyclable
Atmosphere	Forensics	Nucleic acid
Atom	Glass	Nucleus
Base	Glaze	Organic
Bond	Gold	Period
Calcium	Graphite	Plastic
Carbohydrates	Grifter	Radioactivity
Carbon	Group	Reclamation
Chemistry	Halogen	Recycle
Chromatography	Helix	Semiconductor
Collage	Hydrocarbon	Spectrogram
Column	Inert	Spectroscopy
Compounds	Insulator	Shroud
Conductivity	Ion kiln	Superconductor
Conductor	Lead	Technology valence
Diagnostic	Lipids	Vermiculite volatile
Electron	Mass	X-rays
Elements	Metal	

**3. Proper Names:**

Marie Curie	Amchitka
Sherlock Holmes and Dr. Watson:	Point Hope
Sir Arthur Conan Doyle	Point Wainwright
Helen Keller	OSHA
Gregor Mendeleev	Shroud of Turin
Poker Flats	Hindenberg dirigible
Kodiak Island	ALD disease

#### 4. Ideas:

Age of Enlightenment

Japanese Tea Ceremony

Venn diagram

#### 5. Phrases

Air raid drill

Alkaline earth metals

Atomic number

Boiling point

Carbon dioxide

Chemical reactivity

Compound

Symbol

Covalent bond

Dihydrogen monoxide

Electron configuration

Firing pottery

Freezing point

Hydrogen bond

Inorganic compounds

Mineral ore

Periodic Table

Potassium-argon dating

Rare earth metals

Silver nitrate

Transition elements

Valence electrons

It's elementary, my dear Watson

alkali metals

atomic mass

atomic particle

carbon-14 dating

carbon monoxide

chemical bond

element

chemical warfare

crystalline structure

electrical charge

electron energy level

half-life

heavy metals

ionic bond

melting point

nuclear medicine

physical science

Raku pottery

silicon chip

tetrahedron

transition metals

## RESOURCES

### I. Bibliography – Teacher/Professional Books and Resources

1. Hellemans, A. and Bunch, B. (1991). The Timetables of Science: A Chronology of the Most Important People and Events in the History of Science. Simon and Schuster, NY.
2. Hirsch, E.D. Jr., Kett, J.F. and Trefil, J. (1988). The Dictionary of Cultural Literacy: What Every American Needs to Know. Houghton Mifflin Company, Boston, MA.
3. Green, J. (1995). The Green Book of Songs by Subject. Professional Desk References, Inc., Nashville, TN.
4. Grun, B. (1991). The Timetables of History: A Horizontal Linkage of People and Events. Simon and Schuster, Inc., NY.
5. Holt, Rhinehart and Winston (2000). Visualization Chemistry. NY.
6. Holt, Rhinehart and Winston (1999). Modern Chemistry. NY.
7. Brown, LeMay and Bursten. (2000). Chemistry: The Central Science. 8<sup>th</sup> ed. Prentice Hall, NJ.
8. Zumdahl, S.S. (1993). Chemistry, 3<sup>rd</sup> ed. D.C. Heath & Co., MA.
9. Glencoe, McGraw-Hill (1999). Physical Science. NY.
10. Glencoe, McGraw-Hill (1999). Science Interactions. NY.
11. Visible Ink Press (2001). Video Hound's Golden Movie Retriever. MI.
12. Shakashiri, B. Chemical Demonstrations: A Handbook for Teachers of Chemistry. University of Wisconsin Press, WI.
13. Obstler, M. (2000). Out of the Earth Into the Fire. The American Ceramics Society, OH.
14. Mittler, G. (2000). Art in Focus. Glencoe, McGraw-Hill, CA.
15. American Forest Foundation (1995). Project Learning Tree: Environmental Education Activity Guide. Washington, DC.
16. Emsley, J. (2002). Nature's Building Blocks: An A-Z Guide to the Elements. Oxford University Press, UK.
17. Anchorage School District Guiding Principles, Recommendations, and Science as a Process Frameworks. Adopted 1999.
18. Content and Performance Standards for Alaska Students. Alaska Department of Education & Early Development. Revised February 2000.
19. Prentice Hall (2000). Science Explorer Vol. L, Chemical Interactions. NJ.
20. Translating Standards to Practice: A Teacher's Guide to the Use and Assessment of the Alaska Science Standards Levels 3 & 4. Alaska State Department of Education & Early Development.
21. Margolin, M. (2000). ABC's of Chemistry, Hands on Science Series.

### II. Bibliography – Student Books on loan from Media Center for classroom use as anticipatory sets, to read in class and/or as I-Search Projects

1. *Frozen Lady*, Susie Arnot
2. *To Build a Fire*, Jack London
3. **REENBERG, BARBARA R. AND PATTERSON, DIANNE, (1998) ART IN CHEMISTRY; CHEMISTRY IN ART. TEACHER IDEAS PRESS.**
4. **HEISERMAN, DAVID L. (1992) EXPLORING CHEMICAL ELEMENTS AND THEIR COMPOUNDS. TAB BOOKS**
5. **STWERTKA, ALBERT. (1998) OXFORD GUIDE TO THE ELEMENTS. OXFORD UNIVERSITY PRESS CHILDREN'S BOOKS**
6. EMSLEY, JOHN. (1999) MOLECULES AT AN EXHIBITION: PORTRAITS OF INTRIGUING MATERIAL IN EVERYDAY LIFE. GETTY CENTER FOR EDUCATION IN THE ARTS.
7. EMSLEY, JOHN (2002) THE 13<sup>TH</sup> ELEMENT: THE SORDID TALE OF MURDER, FIRE, AND PHOSPHOROUS. JOHN WILEY & SONS
8. FEYNMAN, RICHARD P. (1985) "SURELY YOU'RE JOKING MR. FEYNMAN!" WW NORTON & CO, INC., NEW YORK, NY.
9. FITZGERALD, KAREN. (1996) THE STORY OF OXYGEN. FRANKLIN WATTS (GROLIER), DANBURY, CT.

10. FITZGERALD, KAREN. (1997) THE STORY OF NITROGEN. FRANKLIN WATTS (GROLIER), DANBURY, CT
11. FLOWERS, CHARLES (1998) A SCIENCE ODYSSEY, 100 YEARS OF DISCOVERY. WILLIAM MORROW & CO, INC., NEW YORK, NY.
12. HARGITTAI, ISTVAN, ED. BY MAGDONA HARGITTAI. (2000) CANDID CONVERSATIONS WITH FAMOUS CHEMISTS. IMPERIAL COLLEGE PRESS, LONDON, ENGLAND.
13. HICKHAM, HOMER (1998) OCTOBER SKY (ORIGINALLY PUBLISHED AS ROCKET BOYS), DELL (RANDOM HOUSE), NEW YORK, NY.
14. SACKS, OLIVER (2001) UNCLE TUNGSTEN. KNOPF, NEW YORK, NY.
15. SCHWARCZ, JOE (2002) THE GENIE IN THE BOTTLE: 67 ALL-NEW DIGESTIBLE COMMENTARIES ON THE FASCINATING CHEMISTRY OF EVERYDAY LIFE. OWL BOOKS
16. STRATHERN, PAUL (2002) MENDELEEV'S DREAM: THE QUEST FOR THE ELEMENTS. BERKLEY PUBLISHING GROUP.

### III. Educational Films/Videos

Volcano, National Geographic  
 Discover, Shroud of Turin  
 Magic School Bus at the Waterworks  
 Elements Organized  
 Chemistry Series, VHS Frank Cardulla et al.  
     Interpreting an Equilibrium  
     Basic Concepts  
     LeChateller's Principle I, II  
     Percent Composition  
     Self-Ionization of Water  
     Chemistry pH-Strong Acids and Bases  
     Weak Acids and Bases

### IV. Commercial Films/Videos

1. Ghost
2. Erin Brokovitch
3. A Beautiful Mind
4. Never Cry Wolf
5. Miracle Worker
6. 2001 Space Odyssey
7. Dead Man Walking
8. Death Hunt, Charles Bronson
9. White Fang
10. Space 1999, Martin Landau
11. Nuclear Café
12. Simpson's episode with Nuclear power plant
13. China Syndrome
14. Verizon Commercial
15. Back to the Future
16. Ch. 2 News clips (NBC) Beluga whales of Cook Inlet
17. News clips US Navy testing Deep Sonar effect on whales
18. Teacher Movie clips (Stand and Deliver,
19. Cool Runnings
20. Glassmaking
21. Pink Panther Strikes Again
22. 48 Hours
23. Blues Brothers
24. News clip Hindenberg Disaster

25. Weird Science-Making a girl
26. Medicine Man
27. Crossing Jordan episode of a death scene

**Poetry (SITES WITH COPYRIGHT POETRY ON THE ELEMENTS:)**

[www.everypoet.com/absurdities/elements](http://www.everypoet.com/absurdities/elements)  
[http://www.xs4all.nl/~jcdverha/scijokes/3\\_1.html#subindex](http://www.xs4all.nl/~jcdverha/scijokes/3_1.html#subindex)  
[www.sfu.ca/chemcai/genchem.html](http://www.sfu.ca/chemcai/genchem.html)

**Drama (Stage Productions) ARSENIC AND OLD LACE, Joseph Kesselring, 1941**

**Music**

1. Should I Stay or Should I go?
2. Element Song, Tom Lehrer
3. Diamonds are a Girl's Best Friend
4. Diamonds are Forever
5. "One Man's Trash..." John McCutcheon Rounder Records
6. Don't toss this away, Lone Justice
7. Banana Slugs recycling song
8. RESPECT, Aretha Franklin
9. We are Family!
10. The Star Spangled Banner

**VI. Resource People/Mentors**

1. Emergency Preparedness Official
2. Forensic Scientist, State Crime Lab
3. Potter
4. Registered Dietician
5. Recycling Center representative

**VII. Field Trips**

RECYCLING CENTER, LANDFILL, POTTERY STUDIO, STATE CRIME LAB, MORTUARY, COMMERCIAL KITCHEN

**VIII. Other Material (CD-ROM, Laser Disc, Internet sites, etc.)**

1. [www.chemsoc.org/viselements/pages/pertable\\_fla.htm](http://www.chemsoc.org/viselements/pages/pertable_fla.htm)
2. [www.uky.edu/Projects/Chemcomics/html/mm\\_8\\_14.ac.html](http://www.uky.edu/Projects/Chemcomics/html/mm_8_14.ac.html)
3. <http://superdeluxe.com/elemental/>
4. [www.iscifistory.com/scifaku/elements/periodichaihu.asp](http://www.iscifistory.com/scifaku/elements/periodichaihu.asp)
5. <http://wild-turkey.mit.edu/Chemicool>
6. [www.stanford.edu/~glassman/chem/index.htm](http://www.stanford.edu/~glassman/chem/index.htm)
7. <http://paul.merton.ox.as.uk/science/dhmo.html>
8. [www.howe.k12.ok.us/~jimaskew/ptable.htm](http://www.howe.k12.ok.us/~jimaskew/ptable.htm)
9. [www.infoplease.com/pa/A077959.html](http://www.infoplease.com/pa/A077959.html)
10. <http://chemlab.pc.maricopa.edu/periodic/periodic.html>
11. **SITES WITH CHEMISTRY SONGS:** [www.tranquility.net/~scimusic/resources.html](http://www.tranquility.net/~scimusic/resources.html)  
<http://skynet.oir.ucf.edu/~mschell/Chemistry/>  
<http://sing-smart.com/>