Course: Physical Science

I. Grade Level/Unit Number: 9 - 12 Unit 4

II: <u>Unit Title</u>: Structure and Properties of Matter

III. <u>Unit Length:</u> 14 days (based on a 90 minute per day schedule)

IV. <u>Major Learning Outcomes</u>

<u>Structure of Matter</u>

- Illustrate how observations and conclusions from experimentation changed atomic theory over time.
- Explain Dalton's atomic theory, which states the following:
    - Chemical elements are made up of atoms.
    - The atoms of an element are identical in their masses. (*Be sure students understand that this was shown to be false with the discovery of isotopes.)*
    - Atoms of different elements have different masses.
    - Atoms only combine in small, whole number ratios such as 1:1, 1:2, 2:3 and so on.
- Explain and illustrate J. J. Thomson's plum pudding model.
- Explain Rutherford's gold foil experimental conclusions. The atom is mainly empty space with a dense positively charged center.
- Explain Bohr's model. Show how electrons are arranged in energy levels. Illustrate models with electrons in energy orbits.
- Describe the electron cloud model and identify the number of electrons in each level ($2n^2$), focusing on the following levels: 2, 8, 18, and 32. Describe the charge, relative mass, and the location of protons, electrons, and neutrons within an atom.
- Calculate the number of protons, neutrons, electrons, and mass number in neutral atoms and ions.
- Explain how the different mass numbers of isotopes contributes to the average atomic mass for a given element. (S*tudents are expected to understand this conceptually, not calculate.)*
- Write the symbols for various isotopes (examples Carbon-12, ${}^{12}_{6}C$, C-12).
    - Draw Bohr models from hydrogen to argon, including common isotopes.

<u>Properties Of Matter</u>

- Define and explain physical properties.
- Calculate the density of different substances (solids, liquids, and gases)

- $D = \frac{m}{V}$
- Recognize that phase changes are physical changes.
- Investigate phase changes.
  - Graph, label and analyze heating/cooling curves for various substances. (*Students are not expected to do specific heat and phase change calculations unless as an enrichment topic*.)
- Determine the identity of various substances by comparing properties with known substances.
- Define group (family) and period.
- Locate the following on the periodic table: alkali metals, alkaline earth metals, transition metals, halogens, noble gases, metals, nonmetals, metalloids.
- Compare and contrast the physical and chemical properties of metals, nonmetals, and metalloids. (Properties should include but not be limited to reactivity, physical state, melting and boiling point, ductility, malleability, conductivity, and luster.)
- Analyze the periodic trend for atomic radius (left to right and top to bottom on periodic table).

Inquiry

- Develop questions for investigation from a given topic or problem.
- Distinguish and appropriately graph dependent and independent variables.
- Report and share investigation results with others.
- Discuss the best method of graphing/presenting particular data.
- Use technology resources such as graphing calculators and computers to analyze data.
- Use questions and models to determine the relationships between variables in investigations.
- Read and interpret Material Safety Data Sheets (MSDS).
- Read and analyze newspaper, journal, and on-line articles.

V. Content Objectives Included (with RBT Tags) :

Objective Number	Objective	RBT Tag
5.01	Develop an understanding of how scientific processes have led to the current atomic theory. • Dalton's atomic theory. • J. J. Thomson's model of the atom. • Rutherford's gold foil experiment • Bohr's planetary model. • Electron cloud model.	B2
5.02	Examine the nature of atomic structure: • Protons. • Neutrons. • Electrons. • Atomic mass. • Atomic number. • Isotopes.	B2
5.03	Identify substances through the investigation of physical properties: • Density. • Melting point. • Boiling point.	B3
6.01	Analyze the periodic trends in the physical and chemical properties of elements. • Groups (families). • Periods.	B4
1.01	Identify questions and problems that can be answered through scientific investigations.	B3
1.02	Design and conduct scientific investigations to answer questions about the physical world. • Create testable hypotheses. • Identify variables. • Use a control or comparison group when appropriate. • Select and use appropriate measurement tools. • Collect and record data. • Organize data into charts and graphs. • Analyze and interpret data. • Communicate findings.	B6,A5
1.03	Formulate and revise scientific explanations and models using logic and evidence to: • Explain observations. • Make inferences and predictions. • Explain the relationship between evidence and explanation.	C5

1.04	Apply safety procedures in the laboratory and in field studies: • Recognize and avoid potential hazards. • Safely manipulate materials and equipment needed for scientific investigations.	C3
1.05	Analyze reports of scientific investigations of physical phenomena from an informed scientifically literate viewpoint including considerations of: • Appropriate sample. • Adequacy of experimental controls. • Replication of findings. • Alternative interpretations of the data.	A4

VI. English Language Development Objectives (ELD) Included: NC English Language Proficiency (ELP) Standard 4 (2008) for Limited English Proficiency Students (LEP)- English Language learners communicate information, ideas, and concepts necessary for academic success in the content area of science.

Suggestions for modified instruction and scaffolding for LEP students and/or students who need additional support are embedded in the unit plan and/or are added at the end of the corresponding section of the lessons. The amount of scaffolding needed will depend on the level of English proficiency of each LEP student. Therefore, novice level students will need more support with the language needed to understand and demonstrate the acquisition of concepts than intermediate or advanced students.

VII. Materials/Equipment Needed:

Activity	Materials
What's the Matter?	Different materials that represent 3 states of matter (different composition, texture, size, color, etc.--You could use balloons or a closed bottle to incorporate gases.)
Stuff Lab Activity	ring ring stand filter paper funnel magnet cups graduated cylinder water (continued) watch glass stirring rod safety goggles

Styrofoam Bricks?- Demonstration	construction brick “lightweight” brick opaque wrapping material ½ construction brick or ½ Styrofoam brick
Density Lab Activity	ruler balance graduated cylinder water solid objects of both regular and irregular shapes (at least one irregular should be small enough to fit in the graduated cylinder without getting stuck) empty plastic soda bottles vegetable oil food coloring safety goggles
Is It Ice Yet? (Freezing Point of Water) **Too Hot to Handle! Activity (Boiling Point)**	beaker test tube water ice rock salt alcohol thermometers safety goggles timing device hot plate beaker water thermometer timing device
History of Atomic Theories/Model	Internet articles or magazine articles on the life and accomplishments of: • Democritus and Aristotle • John Dalton • J.J. Thomson • Ernest Rutherford • James Chadwick • Niels Bohr • Electron Cloud model (an article on the formation of) Poster board (enough for each group) Colored pencils or markers

First 25 Elements You Should Know White Board Review	white boards Expo markers paper towels
Isotope M&M®'s Activity	(Per Group) Digital balance One fun size bag, plain M&M®'s One fun size bag, peanut M&M®'s
Colored Periodic Table Activity	complete periodic table (from the previous day's activity- Grid Work Activity) blank periodic table colored pencils or crayons
Periodic Table Organization Reinforcement Activity	white boards Expo markers paper towels
Metal/Nonmetal Activity	Cu foil and Cu wire Mg ribbon Pb shot and Pb sheet chunks of charcoal Silicon (optional) plastic Petri dishes (or any container) conductivity testers safety goggles
Reactivity Lab Activity	Cu foil Mg ribbon Pb sheet solid chunks of C (charcoal) plastic Petri dishes 4 test tubes with much diluted HCl test tube racks periodic table safety goggles aprons
Element Advertisement Activity	Computer Posterboard Markers
Structure of the Atom White Board Activity	Whiteboards (or equivalent) Erasable markers
ATOM! Activity	Card markers ATOM! cards periodic tables

VIII. Detailed Content Description:

Please see the detailed content description for each objective in the Physical Science Support document. The link to this downloadable document is in the Physical Science Standard Course of Study at:

http://www.ncpublicschools.org/curriculum/science/scos/2004/26physical

IX. Unit Notes:

Overview of Unit Four

This unit includes daily lessons and activities for the major topics of the structure and function of matter. Specific topics include the development of current atomic theory, the structure of the atom, physical properties such as density, melting point, freezing point, and the periodic trends in the physical and chemical properties of elements.

In each unit, Goal 1 objectives which relate to the process of scientific investigation are included. In each of the units, students will be practicing the processes of science: observing, hypothesizing, collecting data, analyzing, and concluding. **Goal 1 objectives are an *integral* part of *each of the other goals*.** In order to measure and investigate scientific phenomena, students must be given the opportunity to design and conduct their own investigations in a safe laboratory. Investigations may also be conducted using simulations.

The unit guide below contains the activities that are suggested to meet the Standard Course of Study (SCOS) Goals for Unit Four. The guide includes activities, teacher notes on how to implement the activities, and resources relating to the activities which include language objectives for ESL (English as a Second Language) students. Teachers should also consult the Department of Public Instruction website for English as a Second Language at: http://www.ncpublicschools.org/curriculum/esl/ to find additional resources. If a teacher follows this curriculum (s)he will have addressed the goals and objectives of the SCOS. However, teachers may want to substitute other activities that teach the same concept. Teachers should also provide guided and independent practice from the textbook.

Reference Tables:
The North Carolina Physical Science Reference Tables were developed to provide essential information that should be used on a regular basis by students, therefore eliminating the need for memorization. It is suggested that a copy be provided to each student on the first day of instruction. A copy of the reference tables can be downloaded at the following URL:

http://www.ncpublicschools.org/docs/accountability/testing/eoc/PhysicalScience/physicalsciencereferencetable.pdf

Essential Questions:
Essential questions for this unit are included with the activities in the first column of the guide. Essential questions are those questions that lead to student understanding. Students should be able to answer these questions at the end of an activity. Teachers are advised to put these questions up in a prominent place in the classroom. The questions can be answered in a journal format as a closure.

Safety: Students should wear chemical splash goggles during any lab activity involving chemicals. This includes household substances. **It is extremely important for the safety and success of your students that you do ALL activities and labs prior to assigning them to students.** At the beginning of each lab, the teacher should address any specific safety concerns relating to the activity.

Modified Activities for LEP Students:
Those activities marked with a ⚑ have a modified version or notes designed to assist teachers in supporting students who are English language learners. Teachers should also consult the Department of Public Instruction website for English as a Second Language at: http://www.ncpublicschools.org/curriculum/esl/ to find additional resources.

Computer Based Activities:
Several of the recommended activities are computer based and require students to visit various internet sites and view animations of various biological processes. These animations require various players and plug-ins which may or may not already be installed on your computers. Additionally some districts have firewalls that block downloading these types of files. Before assigning these activities to students, it is essential for the teacher to try them on the computers that the students will use and to consult with the technology or media specialist if there are issues. These animations also have sound. Teachers may wish to provide headphones if possible.

Suggested Web Sites:
Below is a list of suggested websites for various topics discussed in Unit Four.

Matter
http://www.chem4kids.com/files/matter_intro.html

Charge and Charge Interactions
http://www.glenbrook.k12.il.us/GBSSCI/PHYS/CLASS/estatics/u8l1a.html

Matter Structure

http://chemistry.about.com/od/generalchemistry/a/gedreview_2.htm

The Structure of Matter
http://www.ualberta.ca/~jplambec/che/struct/s0302.htm

The Structure of Matter
http://www.edumedia-sciences.com/m118_l2-the-structure-of-matter.html

Shockwave Animations
http://preparatorychemistry.com/Bishop_KMT_frames.htm

X. Global Content: Aligned with 21st Skills:

One of the goals of these Unit Plans is to provide strategies that will enable educators to develop the 21st century skills for their students. As much as students need to master the NCSOS goals and objectives, they need to master the skills that develop problem solving strategies as well as the creativity and innovative thinking skills that have become critical in today's increasingly interconnected workforce and society.
The Partnership for 21st Century Skills website is provided below for more information about the skills and resources related to the 21st Century classroom.

http://www.21stcenturyskills.org/index.php?option=com_content&task=view&id=27&Itemid=120

NC SCS Physical Science	21st Century Skills	Activity
	Communication Skills	
Goal 1	Conveying thought or opinions effectively	• I Spy activity • Stuff lab • Density lab • Is it ice yet? • Too hot to handle • History of atomic theory research • Reactivity lab • Element advertisement
Goal 1	When presenting information, distinguishing between relevant and irrelevant information	• I Spy activity • Stuff lab • Density lab • Is it ice yet? • Too hot to handle • History of atomic theory research • Periodic Table Information Independent Practice • Reactivity lab

		• Element advertisement
Goals 1-6	Explaining a concept to others	• Stuff lab • Book drop activity • Density lab • Is it ice yet? • Too hot to handle • History of atomic theory research • Element advertisement
	Interviewing others or being interviewed	
	Computer Knowledge	
Goals 1-6, esp. Goal 1	Using word-processing and database programs	• History of atomic theory research • Element advertisement
Goals 1-6, esp. Goal 1	Developing visual aides for presentations	• History of atomic theory research • Element advertisement
Goal 1	Using a computer for communication	• History of atomic theory research • Element advertisement
	Learning new software programs	• History of atomic theory research • Element advertisement
	Employability Skills	
Goals 1-6	Assuming responsibility for own learning	All activities
Goals 1-6, esp. Goal 1, 2.02, Goal 3, Goal 4, 5.03, 6.02, 6.05	Persisting until job is completed	All activities
Goals 1-6	Working independently	• Styrofoam brick demonstration • Density lab • Phase diagram practice • Periodic Table Information Independent Practice • Drawing Bohr Model Diagrams • Grid work • Metal/nonmetal Activity • Element advertisement • Reactivity of elements • ATOM bingo
	Developing career interest/goals	• Element advertisement
Goal 1	Responding to criticism or questions	• History of atomic theory research
	Information-retrieval Skills	

Goal 1	Searching for information via the computer	• Various online extensions as related to the web sites given in suggested web sites • History of atomic theory research • Element advertisement
Goal 1	Searching for print information	• History of atomic theory research • Element advertisement
	Searching for information using community members	• Element advertisement
	Language Skills - Reading	
Goal 1-6	Following written directions	Most of the activities can be presented as opportunities for students to follow written directions. The teacher will have to work with most students to develop this skill over time. The following activities are well suited to developing skills in following directions: • String Activity • Density lab • Is it ice yet? • Too hot to handle • Phase diagram practice • History of atomic theory research • Periodic Table Information Independent Practice • Drawing Bohr Model Diagrams • M&M® isotopes
Goals 1-6	Identifying cause and effect relationships	• I Spy activity • Stuff lab • Styrofoam brick demonstration • Density lab • Is it ice yet? • Too hot to handle • History of atomic theory research • Reactivity lab • Reactivity of elements • ATOM! Activity
Goals 1-6	Summarizing main points after reading	• History of atomic theory research • Element advertisement
	Locating and choosing appropriate	• History of atomic theory

Goal 1	reference materials	research • Element advertisement
Goals 1-6	Reading for personal learning	• History of atomic theory research • Element advertisement
	Language Skill - Writing	
Goals 1-6	Using language accurately	All the activities
Goals 1-6	Organizing and relating ideas when writing	All the activities
Goals 1-6, esp. Goal 1	Proofing and Editing	• Density lab • Is it ice yet? • Too hot to handle • History of atomic theory research • Element advertisement
Goals 1-6, esp. Goal 1	Synthesizing information from several sources	• Is it ice yet? • Too hot to handle • History of atomic theory research • Element advertisement
Goal 1	Documenting sources	• History of atomic theory research • Element advertisement
	Developing an outline	• History of atomic theory research • Element advertisement
1.04	Writing to persuade or justify a position	• Is it ice yet? • Too hot to handle • Element advertisement
	Creating memos, letters, other forms of correspondence	
	Teamwork	
Goal 1, 2.02, Goal 3, Goal 4, 5.03, 6.02, 6.05	Taking initiative	• I Spy activity • Stuff lab • Styrofoam brick demonstration • Density lab • Is it ice yet? • Too hot to handle • Phase diagram practice • History of atomic theory research • First Twenty-five Elements You Should Know • Periodic Table Information Independent Practice • Second Twenty-five Elements You Should Know

		• M&M® isotopes • Metal/nonmetal Activity • Reactivity lab • Element advertisement • Reactivity of elements • ATOM! activity
Goal 1, 2.02, Goal 3, Goal 4, 5.03, 6.02, 6.05	Working on a team	Most of the activities are designed to be done and discussed in teams. The following activities are well suited to developing team interdependence skills: • I Spy activity • Stuff lab • Density lab • Is it ice yet? • Too hot to handle • History of atomic theory research • M&M® isotopes • Metal/nonmetal Activity • Reactivity lab • Element advertisement
	Thinking/Problem-Solving Skills	
Goals 1-6	Identifying key problems or questions	• I Spy activity • Stuff lab • Styrofoam brick demonstration • Density lab • Is it ice yet? • Too hot to handle • Phase diagram practice • History of atomic theory research • Drawing Bohr Model Diagrams • M&M® isotopes • Metal/nonmetal Activity • Reactivity lab • Element advertisement
Goals 1-6	Evaluating results	• I Spy activity • Stuff lab • Styrofoam brick demonstration • Density lab • Is it ice yet? • Too hot to handle • History of atomic theory research

		• Drawing Bohr Model Diagrams • M&M® isotopes • Reactivity lab • Element advertisement
Goals 1-4, 5.02, 5.03, Goal 6	Developing strategies to address problems	• I Spy activity • Stuff lab • Density lab • Is it ice yet? • Too hot to handle • History of atomic theory research • Drawing Bohr Model Diagrams • M&M® isotopes • Reactivity lab • Element advertisement
Goal 1, 2.02, Goal 3, Goal 4, 5.03, 6.02, 6.05	Developing an action plan or timeline	• I Spy activity • Stuff lab • Density lab • Is it ice yet? • Too hot to handle • Drawing Bohr Model Diagrams • History of atomic theory research • Reactivity lab • Element advertisement

Day 1- Properties of Matter

Language (ELP) Objective for LEP students: The students will

- *speak mass and volume definitions to a neighbor.*
- *write sentences using solid, liquid, and gas in a tri-fold poster.*
- *write a conclusion to the "Stuff" lab.*

ENGAGE:

The purpose of this quick game is to have students realize that there is a difference between general and specific properties and to list several specific properties.

Essential Question: How do you classify matter?

Activity: I Spy!

Pick an obscure object in your classroom as your "I spy target". Tell the students that they can only give answers once they are fairly sure they know what your item is. Start by saying "I spy something with mass". After about 5-10 seconds, add "I spy something with mass and volume". Ask for volunteers to answer. After several incorrect guesses, add in one of the specific properties of your item- color, size, shape, etc. Once again ask for volunteers. Once they have correctly picked the item, repeat with something else or let one of your students pick the object and give the "I spy" clues. After several times you can start a discussion on how much easier it was once you gave color, size, shape etc. This leads to a discussion of general (mass & volume) vs. specific properties (color, size, shape).

LEP Modifications:

- *Review vocabulary words: mass and volume.*
  - *As a class go over definitions.*
  - *Have students turn to a neighbor and speak the definition.*
  - *Review how to measure mass and volume.*
  - *Review the units used to measure mass and volume.*
- *Model an easy and familiar object to explain the rules for "I spy". Some LEP students may have never played this game before. If students have played this game before, ask them what it's called in their language. This may help others that are struggling.*

EXPLORE:
The purpose of this activity is to introduce matter – what it is and its variations.

What's the Matter?

The purpose of this activity is to introduce matter – what it is and its variations.

Materials: different materials that represent 3 phases of matter (different composition, texture, size, color, etc.---You could use balloons or closed bottle to incorporate gases.)

Prepare a collection of items/materials for each group. Have them observe the items and then group them into categories. Properties (characteristics) observed in this manner are called physical properties. This allows the students to note the similarities and differences and then to make their own decisions as to how they group them. When finished, have the student groups compare how they have organized the items and discuss why they organized them in this manner. If no one has grouped items by heaviness or size, be sure to lead them to this and use this as an introduction to mass and volume as some students confuse the two. Do the same for the materials that represent the 3 phases of matter.

LEP Modifications:

- *Go over the definition of properties.*
- *Go over the definition of physical properties.*
- *You could also use pictures of liquids and gases if you are having a hard time finding these around your room.*
- *Stress to students there is no right or wrong groupings.*

LEP Modifications:

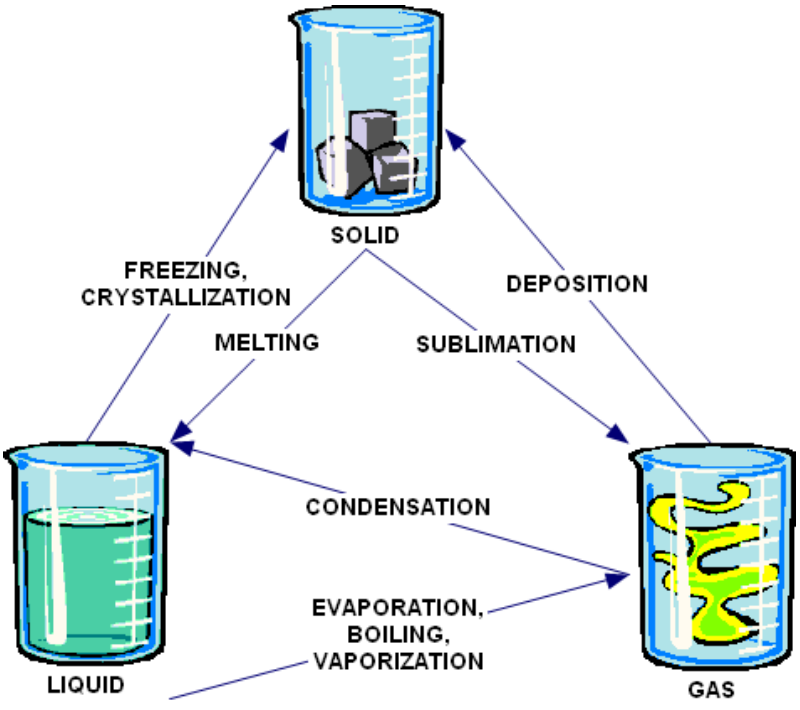
- *As you go over the groupings, talk about particle arrangement.*
  - *Solids- particles are close together and they vibrate only.*
    - *Definite shape and definite volume.*
  - *Liquids- particles are farther apart and the particles can slide over one anther.*
    - *No definite shape and definite volume.*
  - *Gases – particles are even farther apart and the particles are free to move any where.*
    - *No definite shape and no definite volume.*
- *Have students create a tri-fold poster comparing solids, liquids, and gases. Include definitions, drawings of particle arrangement, and examples.*

Follow this with diagrams to represent the particles' motion in the different phases so they can relate the energy related to each. Most students know the phase changes so use this as a spring board and do a diagram or concept map showing the phase changes. Be sure to talk about the fact that some of these absorb heat from their surroundings and thus are cooling processes, while others release heat and are heating processes. (See EXPLAIN below.)

LEP Modifications:

- *Define the vocabulary words as a class (write the word on the board and discuss if they have ever heard the word before, from this discussion come up with a definition of the following vocabulary words: freezing, melting, evaporation, vaporization, sublimation, condensation, boiling, condensation, and deposition. As you are explaining definitions show lots of visual aids (pictures, objects, use computer and projector).*
- *Have students copy definitions and place in their notebooks.*
- *Do not forget some LEP students have limited prior knowledge.*

Changes in States



LEP Modifications:

- *After showing and discussing the previous picture.*
- *Have students create two linear flow charts including pictures and examples. One flow chart gaining heat and one flow chart losing heat. (Students could use magazines or draw their own pictures).*
  - *For example: Solid ---→ Liquid --→ Gas*

Ice	*Water*	*Steam*
Gaining Heat	*Gaining Heat*	*Gaining Heat*

Some students may have grouped items by whether they are "pure" (elements and compounds - made of one thing) or are "mixtures" (made of two or more things). You can identify or mention this here, but will get back into this later. (See EXPLAIN immediately following.)

EXPLAIN

Have students get into small groups to discuss the following, giving evidence for their answers:

- What are some processes that absorb heat from their surroundings?
- What are some processes that release heat to their surroundings?
- How do these processes affect the motion of the particles in their surroundings?

Have students get into different groups to discuss these questions, explaining their reasoning:

- What are pure substances? What are mixtures?
- How are they alike? How are they different?

ELABORATE:

This activity (Stuff Lab Activity) asks students to determine if some "stuff" is a (n) element, compound or mixture. Students will develop and write their own procedure and then write a conclusion based on their data. Since this activity is inquiry-based, you can give your students as much or as little introduction as you feel they need.

Stuff Lab Activity

Materials: ring, ring stand, filter paper, funnel, magnet, cups, graduated cylinder, water, watch glass and stirring rod.

Safety: Students should wear goggles.

Place the equipment they can use out on a table and once you have given them "the stuff" they are on their own. You can make the "stuff" out of a variety of materials-sand, salt, iron filings and beans are a good combination.

LEP Modifications:

- *Model how the equipment is used:*
  - *Ring stand and ring*
  - *Filter paper*
  - *Funnel*
- *Students will need a lot of guidance. You might want to do this with them. Them in pairs at their desk and you in front of the class. Then ask leading questions to guide them through the process.*
  - *We want to separate these items. Have students write a hypothesis.*
  - *What is the first thing you would do?*
  - *What could you do next to separate the remaining items?*
- *As a class come up with a definition of mixture. Give examples and have students tell you examples from their every day lives.*
- *Have students write a conclusion to the laboratory activity.*
  - *Include a definition of mixture*
  - *What did you learned*
  - *Was their hypothesis correct?*

Note to Teacher: Once they start writing their procedure, check to make sure they are not giving data--for example: "Step 1- Remove beans by hand- this gives data, the step should read- Remove larger objects manually." Depending on your students, you may need to watch as they proceed and "guide" them to use a small amount of water once the filings have been removed and then to place a small amount of filtrate on the watch glass and then place on a windowsill for a day.

EXPLAIN:

Once all students have finished the activity, have the students to share their procedures and data with the class. Instruct them to discuss what the "stuff" was-mixture and how they know this. (They could separate it by physical means). Ask students to explain why it wasn't an element or compound. This information will be used to lead on to a discussion of types of matter.

EVALUATE:

Provide a variety of objects denoting the 3 phases of matter. Ask the students to denote the physical properties of each. Check to ensure each student understand the concept of matter. This can be done using whiteboards and markers.

LEP Modifications:

- *Provide pictures of different substances in various states and changing states of matter.*
- *Have students sort the pictures into solids, liquids, or gases or by vocabulary words (condensation, evaporation, etc.).*

Teacher Note: White boards are inexpensive ($10) for an 8' x 4' sheet if shower liner board in the plumbing department at Lowe's that they will cut for you. Tell them you are a teacher and more than likely they will not charge you for the cuts. White boards are an instant source of assessment that will engage students and save time for you. Individual boards with handles are also available at http://www.trainerswarehouse.com/prodinfo.asp?number=WBOS but are more expensive. Another option for reusable "whiteboards" is to laminate sheets of white paper or card stock. Be sure to stockpile whiteboard markers for use with these.

Day 2- Physical Properties: Density

Language (ELP) Objectives for LEP students: The students will
-orally explain how to solve density problems.

ENGAGE:
This demonstration (Styrofoam Bricks?) can serve to introduce this define/explain that density is mass per unit volume, D = m/V.

Essential Question: What is density?

Styrofoam Bricks?: Demonstration

Materials: construction brick, "lightweight" brick, opaque wrapping material, ½ construction brick or ½ Styrofoam brick

Have two bricks of equal shape and volume on your desk. One should be a normal construction brick and the other should be of a much different material such as Styrofoam, but both should be wrapped completely in foil or some other opaque material.

Ask students to describe the two based on their visual observations. They may mention things such as shape, size, color of wrapping material, length, surface areas, or volume. Discuss whether these observations can be measured, and if so how they would be determined and measured. If students have not mentioned anything about mass, ask them if they think the masses are the same and how this can be determined. Have a student pick up both bricks. It is obvious to the student that the two bricks are different masses. Discuss whether the two bricks are made of the same substance if they are the same size but different masses. Students will normally agree that they are different materials due to the mass difference.

Next pull out the ½ construction brick wrapped in the same opaque material. Again have students describe the brick. Then ask if the ½ brick can be made of

the same material as either of the first two. Many will find this concept more difficult because of the difference in volume.

At this point define/explain that density is mass per unit volume. D = m/V

LEP Modifications:

- *Explain the units of density.*
- *Explain how to calculate mass*
  - *Use a balance*
- *Explain how to calculate volume*
  - *Length x width x height –regular solid*
  - *Use graduated cylinder to calculate irregular solids.*
    - *Explain what irregular means.*
- *Have students calculate density of both bricks and compare.*

EXPLORE:

Students will design and plan an experiment to determine whether any of the given objects are made of the same substance. This lab (Density Lab Activity) and its extensions can assist students in understanding density of various samples of matter.

Density Lab Activity

Materials: ruler, balance, graduated cylinder, water, solid objects of both regular and irregular shapes (at least one irregular should be small enough to fit in the graduated cylinder without getting stuck), empty plastic soda bottles, vegetable oil, food coloring
This can be really interesting if the solid objects are all painted the same color.

Safety: Students may be working with glass—plastic graduated cylinders work well with this activity; therefore, they will need to wear closed-toe shoes.

Ask students to design and plan an experiment to determine whether any of the objects are made of the same substance. They will need to construct a data table for recording measurements. Students will also need to show calculations. You may need to remind students that volume can be determined different ways depending on the type and shape of object. Allow the students to investigate, but you may need to ask probing questions to bring them to the ratio of mass/volume as a characteristic property of a substance. They may infer from this that if any two objects have the same ratios then they are the same substance. At this point introduce the term and concept of density if the students have not already done so. You can actually measure the masses and volumes of the "bricks" at some point and calculate the ratios to give practice for V=LWH as well as D=m/V. In order to give more depth to this activity, you can also refer students to reference

tables to determine what substance each object is made from. (Reference tables can be found in textbooks or on the Internet.) This activity can be extended by having students calculate the percent error of their density values using the formula

%Error = [|true value – calculated value| X 100] / true value

(The true value is found in the Physical Science Reference Table.)

Another extension for this activity could be to see which of the objects will float in water. Then ask the students if they can make connections between these observations and the density values they calculated earlier. This information can also be recorded. Be sure to remind students that all of the objects they are using are solids. Ask how they think the results would differ if the objects were hollow.

LEP Modifications:

- *Have objects of varying density available and ask them if the items would sink or float. Have students test these items.*
- *Have the students calculate density.*
- *Have students share their findings with the class.*
- *Have students compare size, shape, mass, and volume with density.*
- *Have students explain density in their own words to a neighbor.*

To show how liquids of different densities interact, have students pour some vegetable oil into the plastic bottle. (You determine the amount depending on supplies). Have students predict what will happen when they add water to the bottle; they can even diagram this. Then they will add water to the bottle and record their observations. Next have students predict what will happen when food coloring is added, and then add the food coloring. Students are to record in writing or in a diagram what they observe. Without moving the bottle, students are to observe what happens to the food coloring. It will work its way down through the oil slowly, but when it reaches the water it will "explode" as it mixes quickly with the water. Have students explain why this happened based on what they know about density.

You can prepare questions about the activity for assessment as well as take up any of the data and calculations.

In the final discussion, you can ask why the food coloring was pulled down (by gravity), and you can introduce the concept of polarity which will be covered in the next unit.

Be sure to talk about the fact that if students were actually trying to determine a substance, they would need at least three identical characteristic physical properties. For example they would have the same boiling points, freezing points, and densities. Discuss the meaning of physical property.

EXPLAIN:
When giving the following practice problems, let students know that they will be responsible for explaining the problems to the class. When they finish, assign the various problems to groups of students to present to the class. Provide each group with a transparency and a transparency pen. Ask students to explain their reasoning for their answers.

ELABORATE:
Provide the following problems (Density Problems Practice Activity) to help students better understand density. Allow students to work in pairs to allow for peer tutoring.

Density Problems Practice

Physical Science **D = mass** **Name** _____
Density Problems **volume** **Date** _____

1. What is the density of 180 grams of methanol whose volume is 600 cm^3?

2. What is the density of a rock whose mass is 28.6 grams and a volume of 15 ml?

3. What is the density of a piece of wood that has a mass of 25 grams and a volume of 29.4 cm^3?

4. What is the density of 450 grams of gas that has a volume of 680 ml?

5. What is the density of 244 grams of aluminum that has a volume of 90 ml?

6. What is the density of an object with a mass of 1.2 grams and a volume of 1.1cm^3?

7. What is the density of a substance with a mass of 61.9grams and a volume of 5.46cm^3?

8. What is the density of a nickel with a mass of 1.02g and a volume of 1.35cm^3?

9. What is the density of a substance that has a mass of 54.2g and a volume of 3.06cm^3?

10. What is the density of a sample if its mass is 44.3g and its volume is 22.1cm^3?

11. What is the density of a material if its mass 2.02g and its volume is 0.500cm^3?

Key:
1. 0.3 g/cm^3
2. 1.91 g/ml
3. 0.85 g/cm^3
4. 0.66 g/ml
5. 2.71 g/ml
6. 1.09 g/cm^3
7. 11.3 g/cm^3
8. 0.756 g/cm^3
9. 17.7 g/cm^3
10. 2.00 g/cm^3
11. 4.04 g/cm^3

LEP Modifications:

- *Complete the first problem on the board. Ask students if they have any questions.*
- *Have students turn to a neighbor and show and explain how to do problem two. Have the neighbor show and explain problem three.*
- *Have students complete the rest on their own.*

Assign the rest of the various problems to groups of students to present to the class. Provide each group with a transparency and a transparency pen. Ask students to explain their reasoning for their answers.

EVALUATE:

Provide the following as a mini quiz. Check for accuracy. Reteach if necessary.

Teacher Notes: Below are the answers to the Density mini quiz.

1) 2.75 g/cm^3
2) 2.7 g/cm^3
3) 11g/cm^3
4) 3.65 g/cm^3
5) .756 g/cm^3

Density- Quiz

Name _____ Date _____ Per __
Show all your work!

1) What is the density of a block of quartz that occupies 310 cm^3 and has a mass of 853 g?

2) A sample of aluminum metal has a mass of 8.4 g. The volume of the sample is 3.1cm^3. Calculate the density of the aluminum sample.

3) A 2.75 g sample of a substance occupies a volume of 250.0 cm^3. Calculate its density.

4) What is the density of a sample of gold that has a mass of 74.0 g and occupies 20.3 cm^3?

5) A sample has a mass of 1.02g and a volume of 1.35cm^3, what is the density of the nickel?

Day 3- Physical Properties - Freezing Point
Essential Question: What are physical properties?

English Language (ELP) Objectives for LEP students: The students will
-write a summary about freezing points.

ENGAGE:
Discuss with students what they know about freezing. Most will know from experience that this is the temperature at which a liquid turns to a solid. Through discussion lead students to understand that the freezing point can be determined through experimentation.

EXPLORE:
In this activity (Is It Ice Yet?), students will devise an experiment to find the freezing point of water using various laboratory equipment. Students should discover that the freezing point of a substance is lowered (freezing point depression) when a solute is added to a solvent.

Is It Ice Yet?
(Freezing Point of Water)

Materials: beaker, test tube, water, ice, rock salt, alcohol thermometers, goggles, timing device

Safety: Students will be working with glass; therefore, they will need to wear closed-toe shoes. TELL STUDENTS OF THIS REQUIREMENT EVERY DAY FROM THE BEGINNING OF THE UNIT. Students who are not properly attired may not participate in the lab—they should complete an alternate assignment during the lab and make up the lab in a way that the teacher sees fit.

Ask students what measurements need to be taken to determine the freezing point of a substance. At this point allow the students to devise an experiment to find the freezing point of water using the equipment listed above. Remind students that before they experiment, they need to decide an appropriate time interval at which to record temperatures and to construct a data table for recording their measurements. Instruct students to graph their data when finished. At this point you can ask students to predict what the graph line will look like. Any of this can be used for assessment.

As you circulate around the room, look to see that their procedures are valid and that the data table is correct. (Time, the independent variable, goes in the first column, and temperature, the dependent variable, goes in the second.) Remind all students to put on goggles as soon as the first group begins the lab and to leave them on until all have finished.

LEP Modifications:

- *Always review independent and dependent variables.*
- *Provide a data table for students to measure their data.*
- *Provide graph paper with labeled axis and instructions.*
- *Have students write a summary on freezing point:*
  - *Include: definitions, what they learned during the lab, examples of freezing in their every day lives.*

Sample:
Students will put approximately 5mL of water in the test tube and place the tube in the beaker. Next have students put a thermometer in the test tube. They will then layer the ice and rock salt in the beaker around the test tube. As soon as this is finished students are to record the temperature of the water in the test tube every 30s until they record the same temperature for 4 minutes.

Graph the data correctly using appropriate scale numbers, legends, and title. (Time on x and Temperature on the y)

In the post lab discussion, make sure that students see the plateau of the graph line as the freezing point. Many students are aware that the freezing point of water is 0°C, but are unaware that melting occurs at the same temperature, so you could discuss this as well.

When all finish, record the freezing points on the board. There may be variations in the measured freezing points, but students generally can conclude at this point that freezing point is a characteristic property of a substance. (Variations are due to using different thermometers – calibration.)

LEP Modifications:

- *You could have half the students do a melting lab, collect data, graph data. This will allow the students to compare their data and make the connections between freezing point and melting point.*
- *Have students write a sentence comparing freezing and melting points.*

By this time students know that the freezing point of a substance is lowered (freezing point depression) when a solute is added to a solvent.

EXPLAIN:

Students discuss the melting and freezing points of water. In doing so, they may be placed into small groups or maintained as a whole class. They should explain their reasoning as they are guided to the realization that melting and freezing points are the same temeperature.

They should also discuss the cause of variation in the recorded freezing points from the activity.

ELABORATE:

As an extension, you could put two test tubes in the beaker at the same time; one test tube with plain water and one test tube with a salt solution. Students can take temperature readings of both and plot both graph lines to see the difference in freezing points. You can either make the solution for the students so that the readings are the same, or you can allow them to make their own.

Be sure to discuss practical applications of freezing point depression such as salt on roads in freezing conditions and the making of homemade ice cream.

Teacher Notes:
Another fun lab extension for freezing point depression is the ice cream in the bag. This activity can be found online.

EVALUATE:
Have students stay in their lab groups and develop three statements about freezing points: two true statements and one untrue statement. They share these with the class and play "Two Truths and a Lie"—with their classmates having to determine which statement is untrue. This provides a good general formative assessment.

Day 4- Physical Properties -Boiling Point

Language (ELP) Objectives for LEP students: The students will
-write a paragraph comparing freezing points and boiling points.
-read phase change diagram questions to their partners.

ENGAGE:

Based on yesterday's activity and their prior knowledge, have students brainstorm what they know and want to know about boiling points. This makes the "K" (know) and "W" (want to know) of a class K-W-L chart. Completing the chart with the "L" (learned) component is part of the closure of today's activity.

EXPLORE:

Too Hot to Handle! Activity (Boiling Point)

Materials: goggles, hot plate, beaker, water, thermometer, timing device

Safety: Be sure to caution students about hot plates, electricity and water, hot water, and glass. Check electrical wiring and outlets before lab.

After students realize that freezing point is a characteristic property, they may infer that boiling point is a characteristic property as well. You can follow the same methods as outlined in the previous activity for freezing point with a change in setup of equipment. Students will undoubtedly choose to use the beaker for the boiling water as opposed to a test tube. Steer them toward smaller amounts of water due to time considerations. Data collection, graphing, and class comparison are done just as in the freezing point lab.

(*** The boiling point of salt water can be determined to show boiling point elevation.)

LEP Modifications:

- *Provide a data table for students to measure their data.*
- *Provide graph paper with labeled axis and instructions.*
- *Have students write a paragraph comparing and contrasting freezing and boiling points.*
    - *Include:*
        - *Definitions*
        - *What they learned during these activities.*
        - *Examples of freezing and boiling in their everyday lives.*

Teacher Note:
Make sure that students understand that all phase changes are physical changes since the substance remains the same.

EXPLAIN:
Have students to present their graphs in class. Instruct them to explain how they derived the boiling point on the graph.

ELABORATE:
Students should complete the "L" component of the the K-W-L chart from the "Engage" portion of today.

Students should write a story that relates their graphs from the two previous activities to the concept of particle motion relating to phases of matter that was brought out in Day One of this unit in the "What's the Matter" activity.

EVALUATE:
Have students to complete the questions (Phase Diagram Practice) regarding the changes in the phases of matter. Be sure to check for accuracy. Reteach if necessary. (This may be a great point to introduce dependent and independent variables when explaining the set-up of the graph.)

LEP Modifications:

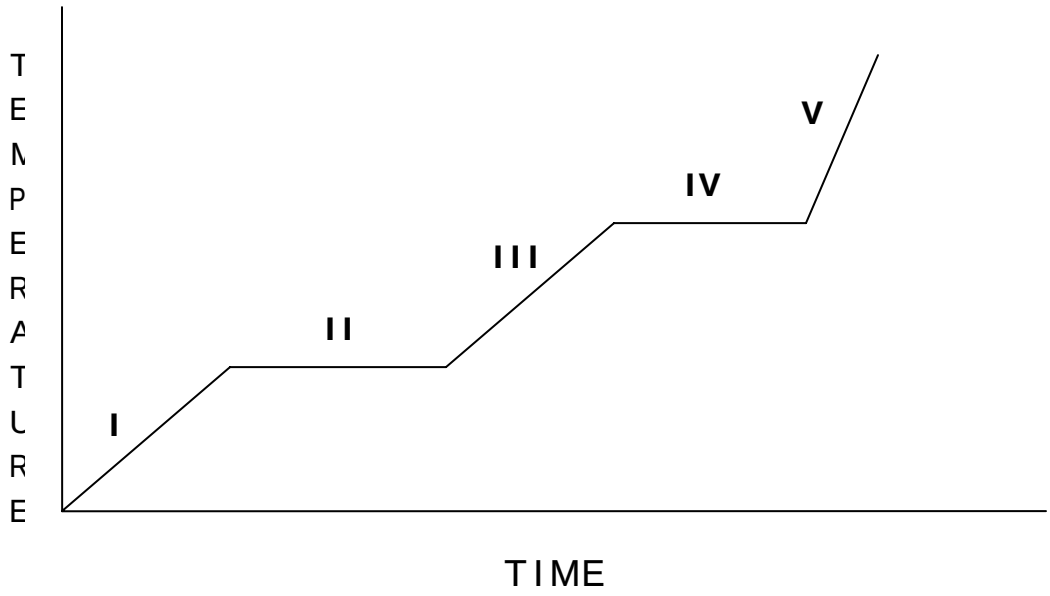
- *Place a phase change diagram on the board and as a class label the diagram. Ask for student volunteers to label diagram.*
- *Review vocabulary (condensation, vaporization, ect…….)*
- *Have students place this information in their notebooks.*
- *Have students work in pairs to complete the phase diagram practice. Only give three foils for each question.*

These questions follow on the next page….

Phase Diagram Practice

Name _____ Date _____ Per_____

Directions: Use the phase diagram to answer the questions regarding the changes of matter.



1. What segment represents the gas phase of this substance?
   A. I
   B. II
   C. IV
   D. V

2. What segment represents the solid phase of this substance?
   A. I
   B. II
   C. IV
   D. V

3. What segment represents liquid phase of this substance?
   A. I
   B. II
   C. III
   D. IV

4. What segments represent(s) phase changes?
   A. I & II
   B. II & IV
   C. III & IV
   D. II only

5. What segments represent changing kinetic energy?
   A. I, III & IV
   B. I, II & IV
   C. I & III
   D. III & V

6. What segment(s) represents a mixture of solid and liquid?
   A. I & II
   B. II & III
   C. II only
   D. IV only

7. What segment(s) represents a mixture of gas and liquid?
   A. I & II
   B. II & III
   C. II only
   D. IV only

8. What segment(s) represents changing potential energy?
   A. II & IV
   B. I,II & IV
   C. I & III
   D. III & V

9. What segment(s) represent no changes in temperature?
   A. I & II
   B. II & IV
   C. III & IV
   D. II only

10. What segments represent changes in temperature?
   A. I & II
   B. II & IV
   C. III & IV
   D. I, III & V

Extended Response: Explain the graph in terms of particulate motion—how does adding/removing energy relate to the temperature and phase of the sample of matter?

Day 5 - Atomic Theory

Essential Question: What is atomic theory?

Language (ELP) Objectives for LEP students: The students will
-read articles about scientist that contributed to the atomic theory.
-write sentences about a scientist that contributed to the atomic theory.
-present (speak about) their posters on the history of atomic theories.

ENGAGE:

Engage students in a discussion regarding how things have evolved over time. Examples that they seem to understand would be the car, the computer, or music players. Have pictures of a line of progression and allow students to help you put them in order. Have them explain why the item may have changed over time. For the car, begin with a horse and buggy, what were its limitations? What were its advantages? Why did it evolve into the horseless carriage? What were its limitations and advantages? You could use any progression that you have or can find pictures of but be sure to include modern and futuristic autos asking the same questions and eventually leading to the question…are we done? Is this the best, most efficient auto that man can make? If not, what next? Keep the conversation directed toward correcting the auto's limitations.

The discussion should focus on how technology relies on established levels of scientific discovery in order to advance. Students will quickly contribute to these and other scenarios. Students should then be informed that the concept of cumulative development will then be applied to scientific theory as they study atomic theory. This is a great segue into the evolution of the atomic theory.

Also, reinforce the idea that a theory is man's best explanation of why something is the way it is or happens the way it happens based on scientific evidence. As long as it works, we keep the theory. (Theories can never be proven, only disproven.)

Teacher Note:

Display a progressive line of pictures dealing with a single item such as car or music players.

EXPLORE:

Students will research the history of atomic theories and models. Your students will be much less comfortable with the topic of the history of atomic theories and models than the evolution of the car, so try grouping them into groups of 2 or 3 students. It is okay if more than one group is researching the same scientist or concept. Give guidance regarding the internet sources, making sure they are reputable and factually correct.

History of Atomic Theories/Models

Materials:

- Internet articles or magazine articles on the life and accomplishments of:
    - Democritus and Aristotle
    - John Dalton
    - J.J. Thomson
    - Ernest Rutherford
    - James Chadwick
    - Niels Bohr

- Electron Cloud model (an article on the formation of)
- Poster board (enough for each group)
- Colored pencils or markers

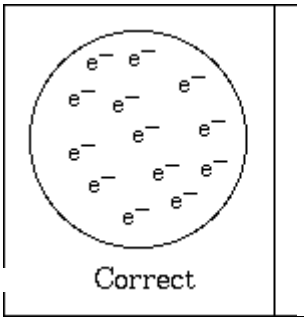
Task: Each group will develop a poster concerning their assigned scientist and their contributions to the atomic theory. Remind them that several of the scientists are credited with many accomplishments but you are focusing on their contributions to the atomic theory. Their poster should include the scientist's name, major advancement to the atomic theory, years of life, and a picture of the scientist's atomic model.

LEP Modifications:

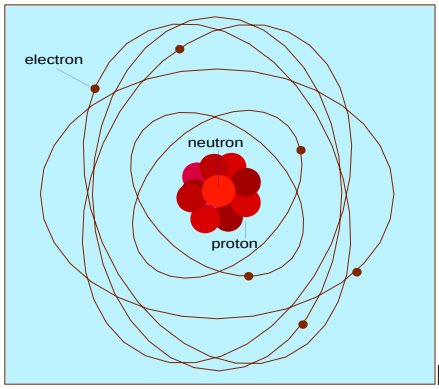
- *This is a great activity for LEP students.*
- *While students are presenting their posters have the other students fill out a chart like the one below to put in their notebook.*

Scientist Name	*Advancement*	*Years of Life*	*Picture/Atomic Model*

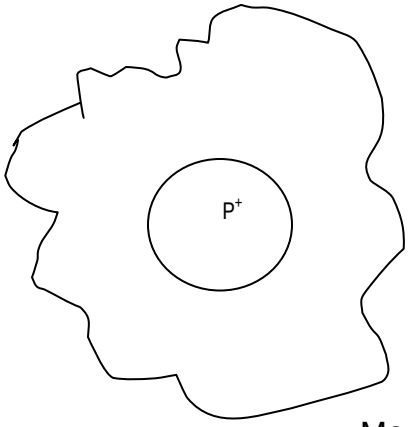
Have the students put the pictures below in order and have each group explain their scientist's contribution to the atomic theory.



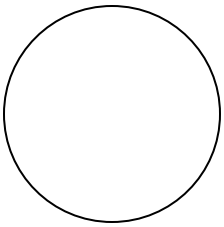
Thomson



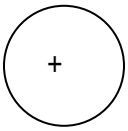
Bohr



Modern



Dalton



Rutherford

Once the class has listened to and added each scientist's contributions, together formulate the modern atomic theory which incorporated each of the scientist's contributions that were not disproved by the next discovery.

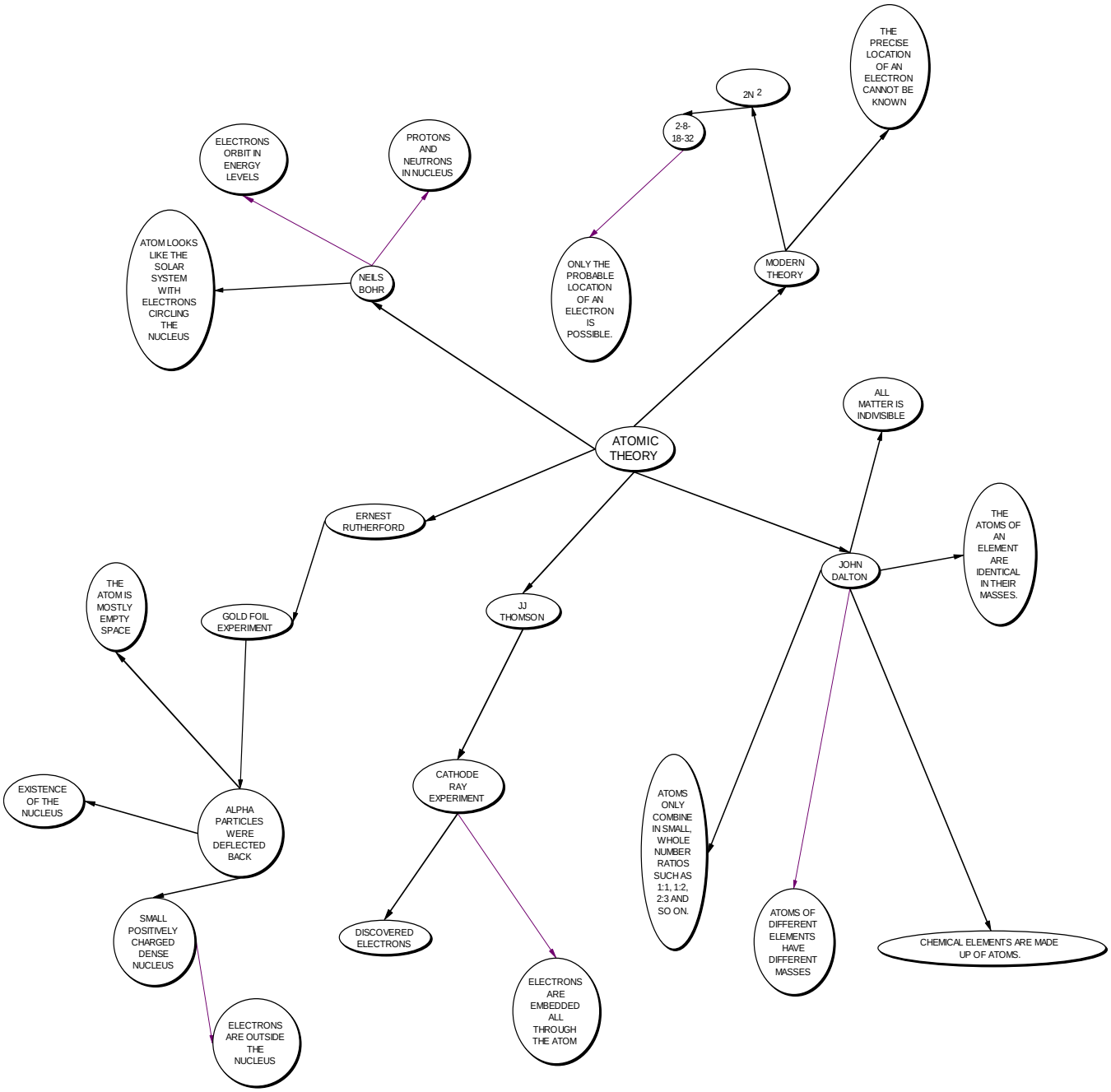
Atomic Theory Web Activity

Have students make a web/concept map about the atomic theory. They should make their own, but may work together in small groups (no more than 3 people). Be sure to monitor time on this.

Once their individual webs/concept maps are complete, they are provided the web on the following page regarding the atomic theory. (It is a good idea, especially for those students who are visual learners, to color code this web. Just make sure the connected information is all color coded the same. It is suggested to color Rutherford's contributions yellow to trigger the gold foil experiment. Also, give ideas to cue the information such as Dalton is indivisible, stressing the letter "d". It helps students to make connections to this information.) Have students compare/contrast their own webs/concept maps with this web.

LEP Modifications:

- *Give students five different colors of post-it notes. If you do not have enough post-it notes, use colored pencils.*
- *On the board place the words that go on each colored post-it notes.*
  - *For example: Yellow – Rutherford, gold foil, dense nucleus, alpha particles bounced back, atom mostly empty space, etc..*
- *Have students create a bubble map of the atomic theories. They can use their notes and book to help if needed.*


ATOMIC THEORY
NEILS BOHR
ELECTRONS ORBIT IN ENERGY LEVELS
PROTONS AND NEUTRONS IN NUCLEUS
ATOM LOOKS LIKE THE SOLAR SYSTEM WITH ELECTRONS CIRCLING THE NUCLEUS
MODERN THEORY
2N 2
2-8-18-32
THE PRECISE LOCATION OF AN ELECTRON CANNOT BE KNOWN
ONLY THE PROBABLE LOCATION OF AN ELECTRON IS POSSIBLE.
ERNEST RUTHERFORD
GOLD FOIL EXPERIMENT
THE ATOM IS MOSTLY EMPTY SPACE
ALPHA PARTICLES WERE DEFLECTED BACK
EXISTENCE OF THE NUCLEUS
SMALL POSITIVELY CHARGED DENSE NUCLEUS
ELECTRONS ARE OUTSIDE THE NUCLEUS
JJ THOMSON
CATHODE RAY EXPERIMENT
DISCOVERED ELECTRONS
ELECTRONS ARE EMBEDDED ALL THROUGH THE ATOM
JOHN DALTON
ALL MATTER IS INDIVISIBLE
THE ATOMS OF AN ELEMENT ARE IDENTICAL IN THEIR MASSES.
ATOMS ONLY COMBINE IN SMALL, WHOLE NUMBER RATIOS SUCH AS 1:1, 1:2, 2:3 AND SO ON.
ATOMS OF DIFFERENT ELEMENTS HAVE DIFFERENT MASSES
CHEMICAL ELEMENTS ARE MADE UP OF ATOMS.

Day 6 – Atomic Structure

Essential Question: What is atomic structure?

Language (ELP) Objectives for LEP students: The students will
-say the names of the first 25 elements to a partner.

ELABORATE:
This activity (First Twenty-five Elements You Should Know) is used to introduce elements, the periodic table, and to instruct students how to properly write the abbreviations for the elements.

Teacher Note: Place a list of twenty-five elements on the board or overhead. Have students copy the list exactly as you have written it. Title it "The First Twenty–five Elements You Should Know".

In order to correctly teach how to write the symbols of elements, go over the rules for doing so. On the board or overhead, write the following rules, giving examples as you go.

"Rules for writing chemical symbols"
#1 capitalize the first letter. Ex: helium H
#2 Lower case the second and/or the third letter Ex: helium He

LEP Modifications:
- *Write the rules on the board before the students begin copying.*
- *Have students take turns repeating the rules out loud.*

Show them that a largely written "e" is not correct; ex: "e". This also means a small written "H" is not correct, either. Ex: hE is not correct. You have to hit on all of these possibilities. Then, assign them to find the symbol if it is missing or the name if it is missing in their list. Assign them to learn these symbols within 3 or 4 days, giving a quiz in order to assess their mastery.

Introduce students to the periodic table with this activity. You should give students a copy of the periodic table from the Physical Science Reference Tables published by NC Department of Public Instruction (refer to unit notes) in order to familiarize them with it.

The list follows….

LEP Modifications:

- *Have students repeat saying the name of the elements out loud.*
- *Then have students turn to a neighbor and say the names of the elements below.*

First Twenty-five Elements You Should Know

1. hydrogen
2. He
3. potassium
4. neon
5. O
6. F
7. boron
8. nitrogen
9. U
10. Arsenic
11. calcium
12. C
13. iodine
14. Fr
15. xenon
16. Br
17. Al
18. Be
19. lithium
20. Ar
21. sodium
22. W
23. radium
24. Si
25. Gold

ELABORATE/EVALUATE: (Formative Assessment)

First 25 Elements White Board Review

Teacher Notes: While this may seem simple, it is a great strategy to reinforce use of the periodic table to your students. It allows them to start learning the locations of elements. White boards are great ways to gain instant assessment as well.

This should be done the day before the quiz on the first 25 elements.

Materials: white boards, Expo markers, paper towels

The day before the quiz on these 25 elements, give students a white board, an Expo marker and a paper towel. Quiz them on the name or symbol of each of the 25 elements. For example, say, “hydrogen” and the kids write the symbol, “H” on their white boards. This is a good strategy to get them ready for the quiz. It also gives you a way to quickly evaluate where your students are at, content wise. O really get them thinking, you can break the symbols down into smaller subgroups to test their knowledge. For example, have them list the elements whose symbols are one letter only. There are 10 of them, H, K, O, N, U, C, I, W and F. Make up as many subgroups as you can; this really stretches them as it is too easy for the simple names or symbols for a lot of kids.

EVALUATE:

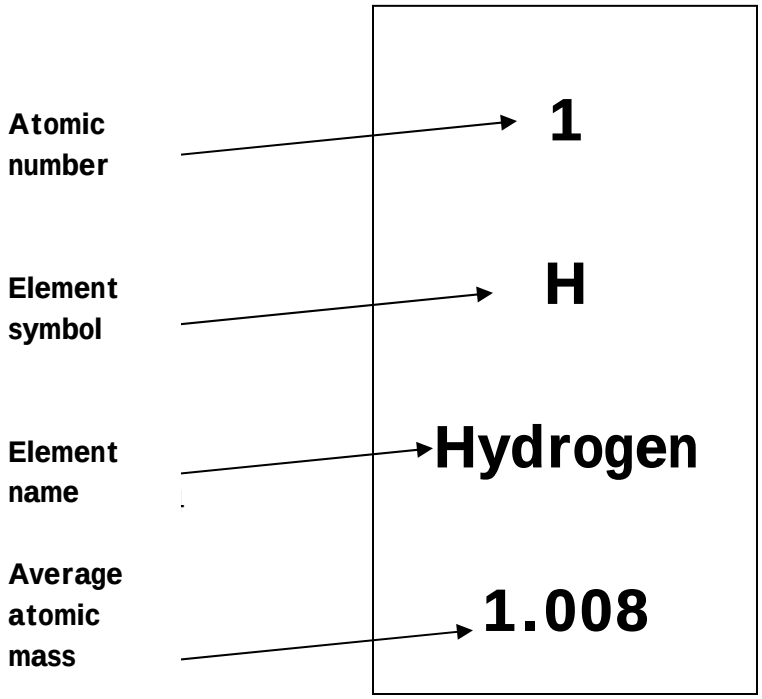
Provide a quiz regarding these first 25 elements they should know. It can include matching the symbol with the respective element and vice-versa. Use of the periodic table on the quiz is optional.

LEP Modifications:

- *Chunk the elements in groups of five on the quiz.*
- *Or give two different quizzes one containing 10 elements and the other containing 15 elements.*

Periodic Table Information

Before you go over this information with your students, have them do a KWL as to what they know about the information contained in the “squares” on the periodic table. Then, once you have shared this “what they know already” with the class, have students copy the square below that is taken from their periodic table. Label the parts of information that are contained in the “square”.



Be sure students understand the difference between atomic number and average atomic mass number.

LEP Modifications:

- *Have students write the definitions of the words (atomic number, atomic mass, and element symbol on the above picture that they copied in their notes.*

Periodic Table Information Independent Practice

After the students have mastered the atomic number and average atomic mass, begin with expressing the importance of the atomic number as it gives an element its own unique identity. Lead a short discussion relating how if an element has 6 protons, it has to be carbon and carbon only. Use the analogy that the proton is like the DNA or fingerprint of an element. No other element will have 6 protons. Stress the concept that the atomic number only indicates the number of protons. Because an atom is electrically neutral it has the same number of electrons (negative charge) as protons (positive charge). Go over 2 or 3 examples for illustration and understanding.

Now introduce mass number as the total number of protons and neutrons in the nucleus of an atom. This can be determined from the periodic table by rounding the average atomic mass to the nearest whole number. Since the mass number combines the number of protons and neutrons, and the atomic number gives the number of protons, you can determine the number of neutrons by subtracting the atomic number from the mass number (# of neutrons = mass # - atomic number).

As soon as you have covered this information with students and have given them several examples, assign them several elements to list this information about. A good idea is to have them list this information for each of the elements in the list of the First Twenty-five Elements as independent practice. You may want them to organize it in a chart or table form. For example,

Element Name	Symbol	Atomic #	Average Mass #	Mass Number	# protons	# electrons	# neutrons
Hydrogen	H	1	1.008	1	1	1	0
Helium		2				2	
		3					
					4		

LEP Modifications:

- *Complete the first two rows together as a class.*
- *Have the students turn to their neighbor and explain how to fill in the third row.*
- *Have the students complete the rest of the chart independently.*

Teacher Note: The rate at which you introduce this information depends greatly upon the readiness of students in your classes. For example, some classes can process all of this information in one session while some students may need to have the amount of information introduced at a slower pace, over 2 or 3 days in smaller chunks.

Day 7- Atomic Structure

Language (ELP) Objectives for LEP students: The students will
-will explain the location of electrons.

The Second Twenty-five Elements You Should Know Practice
Once students have mastered the information given on the periodic table, give the 2nd 25 elements they should know and have students list the same information that they did for the first 25 elements they should know.

The following is a suggested list of the Second Twenty-five Elements You Should Know:
26. Se
27. silver
28. chlorine
29. cobalt
30. P
31. Krypton
32. Ge
33. Cu
34. Tin
35. Cr
36. Cesium
37. Sr
38. Zr
39. Barium
40. Zn
41. Nickel
42. Lead
43. Hg
44. arsenic
45. platinum
46. S
47. Mn
48. Iron
49. Rb
50. Titanium

Element Name	Symbol	Atomic #	Average Mass #	Mass Number	# protons	# electrons	# neutrons
silver							
	Co						

LEP Modifications:

- *Practice is always a good idea.*
- *Have students complete the above chart with the second group of elements as a homework assignment or a quiz.*

ENGAGE:

Parts of the Atom Graphic Organizer

Have students read the parts of their text related to the structure of the atom, noting the location, charge and relative size of protons, neutrons and electrons as well as energy levels. It will be good to have short discussion as to the structure of the atom after students have had time to record the specific information in their notes.

LEP Modifications:

- *Have students get into groups and read to each other the text related to the structure of an atom.*
- *Have students draw, label, and define the parts of at atom.*
- *Have groups exchange drawings to check for accuracy.*

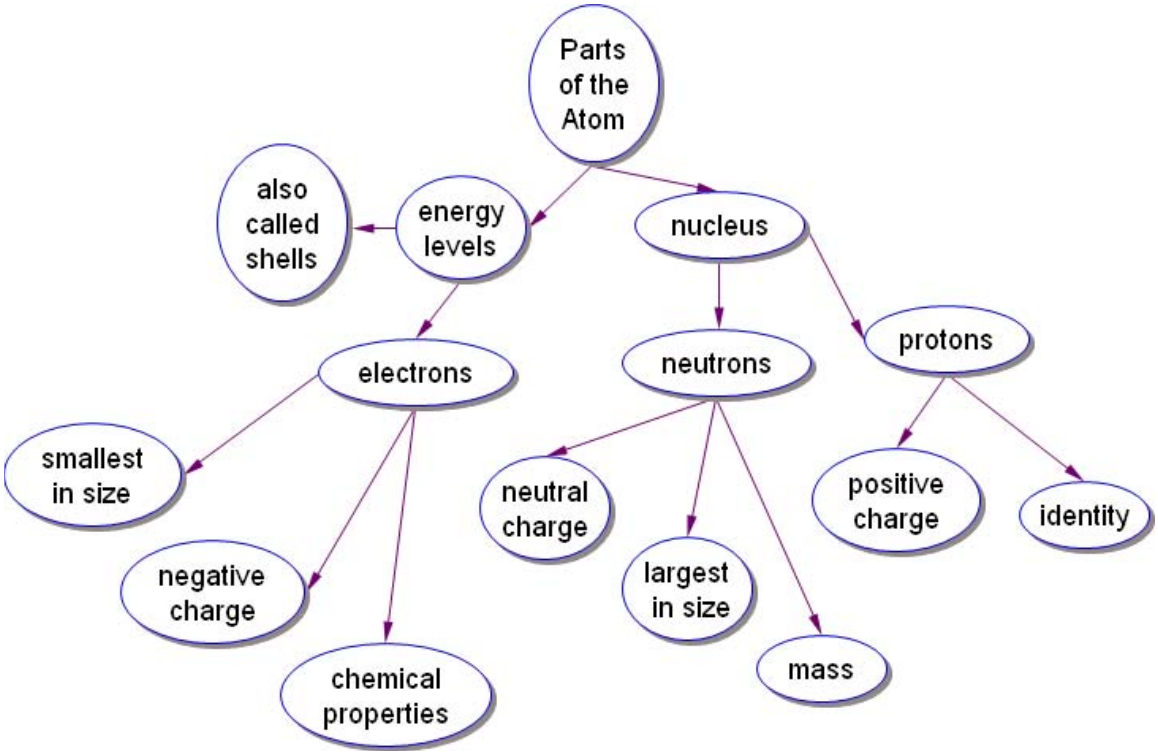
This is a good place to introduce the topic of ions. Ions are formed when the number of electrons is not equal to the number of protons due to the loss or gain of valence electrons. When this happens there is an ion which is electrically charged as opposed to an atom which is electrically neutral. Ions and oxidation numbers will be further covered in the next unit.

LEP Modifications:

- *Show the students examples of ions.*
  - *For example: 10 electrons (-) 11 electrons (-)*
    10 protons (+) 10 protons (+)
    0 1- (negative ion)

A graphic organizer would be good to relate the subatomic particles to their locations, charges and sizes.

Parts of the Atom Concept Map



LEP Modifications:

- *Give the words for the students to use in their graphic organizer.*
- *Have students present their organizers to the class.*

EXPLORE:

Drawing Bohr Model Diagrams
(1st 20 in sequence)
Draw hydrogen, beryllium, and sulfur for explanation. Then have the students draw models of the other elements up to atomic number 20. Be sure to explain the location of electrons in the first four energy levels (2, 8, 18, 32) using $2n^2$ where n is the number of energy level.
Follow the above procedure with electron-dot diagrams which stress the valence, outermost, electrons.

LEP Modifications:

- *Have students create diagrams on construction paper using beans or cereal. Have all students complete a different element.*
- *Hang the papers on the wall for all to see.*
- *Make sure students include: number of protons, neutrons, and electrons.*

A good Internet Activity on Atomic Structure can be found on www.sasinschool.com, quick launch number 1197.

EXPLORE:
In this activity (Isotope M&M®'s Activity), students will use M&M®'s to simulate elements to determine how isotopes are different and how to calculate average atomic mass of an element.

Teacher Notes:
The extremely small size of atoms makes it impossible to count them or determine their individual atomic masses using direct means. An instrument called a *mass spectrometer* allows for such determinations. Average atomic masses depend on the number and masses of the isotopes of the element.

In this activity, students are given one element, *Mm*. There are two isotopes of this element. Both are naturally occurring. The two isotopes are plain and peanut.

Substitutes for candies are beans, marbles, or poker chips.

Be sure students know how to use a balance and be able to tare mass.
If students want to eat their elements, be sure all hands are clean and precautions are used when massing the M&M®'s to protect from contamination. Be sure they only eat their element after every student is finished and the lab time is over. Another suggestion would be to provide "untouched" M&M®'s for student consumption upon completion of the lab.

Isotope M&M®'s Activity

Materials (per group)
- Digital balance
- One fun size bag of plain M&M®'s
- One fun size bag of peanut M&M®'s

Introduction to Student
The extremely small size of atoms makes it impossible to count them or determine their individual atomic masses using direct means. An instrument called a *mass spectrometer* allows for such determinations. Average atomic masses depend on the number and masses of the isotopes of the element.

In this activity, you are given one element, Mm. There are two isotopes of this element. Both are naturally occurring. The two isotopes are plain and peanut.

Procedure

1. Obtain a bag of plain and peanut M&M®'s.
2. Count the number of plain M&M®'s. Record your data in the chart provided.
3. Count the number of peanut M&M®'s. Record your data in the chart provided.
4. Find the total numbers of M&M®'s, both plain and peanut added together. Record your data here.
5. Mass the plain M&M®'s. Record your data.
6. Mass the peanut M&M®'s. Record your data.

Lab Data

Type of Mm	Number of Mm	# of Mm total both Mm	Percentage	Mass	Isotope weighted mass (% x mass)
plain					**(a)**
peanut					**(b)**

Average element Mm mass = weighted mass (a) + weighted mass (b)
Average element Mm mass = _____ + _____ = _____

Questions to Guide Analysis (EXPLAIN)

1. Compare your results to the results of your classmates. Are they the same? Why or Why not?
2. The reported average mass for Mm is different than the average mass that your group calculated. Would you get better results if the entire class' data were combined? Why or why not?

ELABORATE:

Give students this challenge problem: You may give them a hint to use the same method used to calculate the average mass of Mm from the lab.

Calculate the average weighted grade on the last quiz of my class last year on this chapter. Show all work.

5 students made a 100%

20 students made a 80%

EVALUATE:
Have students answer this question in paragraph form:

Atomic masses on the periodic table are not the mass of any one atom of that element. Why is that? Be sure to talk about isotopes and to use the knowledge that you gained from the M&M®'s activity.

Day 8- Periodic Trends (Groups and Periods)

Language (ELP) Objectives for LEP students: The students will
- write and read their definitions of periodic table vocabulary terms.

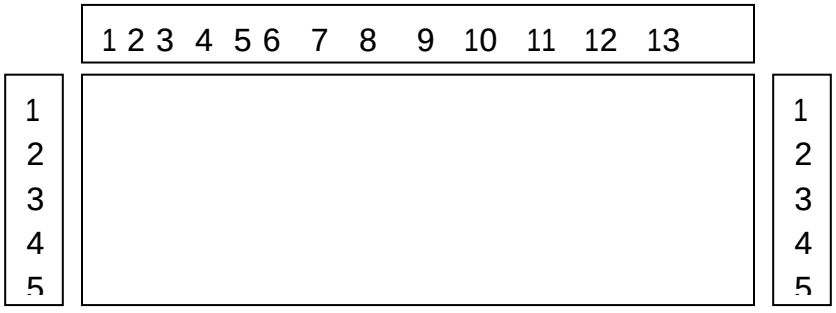
ENGAGE:
Essential Question: What are periodic trends?

Teacher Notes: This activity (Grid Work Activity) serves as an introduction to the period and group/family numbers and locations and as a reinforcement to the location of elements on the periodic table. Please note that the period numbers are not in order. This will allow students to have to "hunt" these elements in order to learn their locations and how to utilize the periodic table.

Grid Work Activity

Materials: Periodic tables (Use the one provided by NCDPI in the Reference tables for physical science.)

As an introduction to the periodic trends of the elements, introduce the students to the periodic table. Initially, label each period #1 - #7 on the left side of each period and also on the right side of each period. Then, have students label each group, # 1 - # 18 on each vertical column of the table as shown below. Have them do this to the complete Periodic Table and give the following notes: "7 horizontal rows are the Periods" and "18 vertical columns are the Groups /Families"



Instruct students to write these notes on this table so that it is there in front of them. As we begin learning to work with and use the periodic table, they can refer back to them in order to remember which is a period and which is a group/family. At this point, ask the students if they see any type of pattern or if the table reminds them of anything they have seen or used before. Usually, someone will remark that the periodic table does resemble a grid. At this point, engage the students in verbal questioning in order to introduce the concept of the table as a grid. Once you are satisfied they have the idea, write several examples of the period numbers and group numbers on your board or overhead. For example,

Period number	Group number	Element Name	Element Symbol
1			
4			
7			
6			
2			
3			
5			
7			
2			

You may list any period number or group you wish. Just make sure the students understand the difference. At this point, a formative assessment activity such as using white boards or a mini group quiz would be a good idea. It could also be in the form of a homework assignment.

LEP Modifications:

- *Prepare an overhead of the period table. Model; write the numbers and vocabulary on the overhead.*
- *Prepare an overhead of the chart. Give the students the element symbol and have the students come up to the overhead and fill in the chart. Have the other students fill in the chart at their desk.*

EXPLORE:

The purpose of this activity (Color the Periodic Table Activity) is to identify how and why the elements are organized on the periodic table.

Color the Periodic Table Activity

Materials: Complete Periodic Table (from the previous days activity), blank periodic table, colored pencils or crayons.

Students will need a complete periodic table (use the one provided by the reference tables from NCDPI to get students acclimated to that one) and a blank periodic table. (Glencoe has one in their transparency packet.), colored pencils or crayons. Give each student a blank periodic table, a complete periodic table (the one form the previous activity) and colored pencils or crayons.

Start out by reviewing the groups/families and period locations by having students number the groups/families (1-18) and periods (1-7) on the blank periodic table. They may use the periodic table form the previous activity for help in numbering the table. Then make a color key that students can write on their blank periodic table. Give all students the same four colors. Once they have numbered the periods and groups/families, have them use the complete table to locate the metalloids along the stair step line. Write in the symbols for the metalloids. Then using one color, yellow for example, color each of the metalloid blocks yellow. Mark the key yellow and metalloid. Next, use a pen or pencil to darken the stair step line so that they can see it. Label it the stair step line. Next, take another colored pencil, say red, and color all of the nonmetals on the chart, including hydrogen. Place the symbol for hydrogen, H, in the correct box. All the while, refer to each block by its group number and period number. For example, call out the instructions that all of group 17 will be red, periods 2 –7, and so on. Continue on until all of the nonmetals are red. Include period 1, group 1, hydrogen. Next, color all of the metals, starting at group 1, period 2 through period 7 light blue. Continue this by calling out the period numbers under the group number. Make sure that they have marked their color key with red as nonmetals and light blue as metals. You will need to have them keep whatever color for metals lighter as you will have them make a specific mark in the transition metals to distinguish them from the other metals. For example, have the students place an “X” in each of the transition metals box. Again, reinforce the idea of the grid as you instruct them to place a green “X” in each of the transition metals, groups 3 –12, periods 3 –7, including the lanthanides and actinides at the bottom of the table. You can then show them how the lanthanides and actinides fit at the bottom of the table because they do not “fit” in the table as it is constructed.

LEP Modifications:

- *Model this activity on the overhead.*
- *On the back of the periodic table have students write the vocabulary words (period, group, halogens, noble gases, alkaline, alkaline earth metals, transition metals, metalloids).*
- *Have students write in their own words complete sentence definition for each word. Have students take turns reading their definitions.*

Parts of the Periodic Table Independent Practice

At this point, you can have the students read the portion of the student text referencing the names of the Groups/Families on the periodic table. Have them write the names of the groups in their notes and on their colored table. For example, Group 1 are the alkali metals, (except hydrogen) group 2 are the alkali earth metals, 3-12 are the transition metals, 17 are the halogens and 18 are the Noble Gases. Make sure to check that they have recorded the correct names for these groups/families. Point out that the lanthanides are in period 6 and actinides are in period 7. Also, have them guess which group these two series belong in. A quiz on this information is a good way to assess how well they understand the structure and names of the groups and other features of the periodic table. Make sure to refer to the "grid" location they can be found in as they learn the location of the elements.

LEP Modifications:

- *Have students take turns reading out loud as a class.*
- *Have students quiz each other on the parts of the periodic table. This will be a good review for a quiz.*

Day 9- Organization of the Periodic Table

Essential Question: How is the periodic table used?

Language (ELP) Objectives for LEP students: The students will
-speak and listen to the vocabulary terms luster, dull, malleable, and ductile.

EXPLAIN

Periodic Table Organization Reinforcement Activity
To reinforce the names of the groups and parts of the periodic table, use white boards (or alternates) to ask students questions related to the content they have been taught the previous days in class. For example, "What is the name of the element in Group 2, period 2?" The more creative the questions, the more higher the level of thinking students can achieve in their answers.

Materials: White boards, paper towels, Expo markers

Teacher Notes: It is extremely important that students buy into the idea of the white boards in order for it to be a successful strategy in your classroom. You can start by having students keep "points" as they answer questions. You may offer these points as extra credit or establish your own system. White boards are an instant source of assessment that will engage students and save time for

you. Make sure your rules and procedures are in place as students will test you to see how much chatter you will tolerate while you are using these in an activity.

LEP Modifications:

- *Write instructions for the game on the board and have students read them to the class.*
- *This could also work as a quiz.*

ELABORATE

Use the following activity for students to elaborate on their prior knowledge of the elements and their arrangement on the periodic table.

Keep close watch and control over the Mg ribbon and the Pb shot. Make sure none leaves the room.

Metal/nonmetal Activity (Metalloid Optional)

Materials: Cu foil and Cu wire, Mg ribbon, Pb shot and Pb sheet, and chunks of charcoal, plastic Petri dishes (or any container), conductivity testers. (Optional: silicon)

Students should wear safety goggles when performing this experiment.

Have students make observations of what they see as the physical properties of the solid samples of these elements and record their observations in their notebooks. See a sample chart below. Once they have recorded their observations, have students test the samples to determine if they will conduct electricity or not. Record the results. As students make their observations, do not tell them what the science terms, malleable, ductile, luster, etc are. Let them brainstorm what these terms mean. Tell them they have examples of each of these terms in their samples. This is where you can really get them thinking and exploring these terms.

Teacher Notes: This is more of a hands-on discussion than a full lab. Be sure to let the kids develop their own ideas and resist the urge to tell them what they are observing! Have several examples of metals and nonmetals available for students to observe and make note of the physical properties. For example, copper, aluminum, lead, charcoal, magnesium are good examples that are relatively inexpensive to purchase. Also, use different forms of these elements. For example, Cu foil and Cu wire, Mg ribbon, Pb shot and Pb sheet, and solid chunks of charcoal. Any will do, but these are spread across the periodic table and will lead nicely into the reactivity lab to illustrate the chemical properties of the elements. (Try to have a metalloid on hand. Silicon is good because of its properties.) Give each group of students one example of each of these elements you decide to use. Place them in a container, plastic Petri dishes work really well because they won't break (shatter) if dropped and the students can observe the

elements. Have them scratch each sample with their fingernail. Make a chart on the board or overhead such as the following: Again, do not tell them what these terms mean. Have them take their observations of the physical appearance of the sample elements and try to deduce the real science meaning. You can give hints. For example, you may want to just list the terms on the board or overhead and they will know what dull means. Have them list the samples that were dull. They will also say shiny. Have them try to figure out what this property is called and lead them to "luster". These are just examples. Help them out by taking a piece of sulfur and tapping it with a hammer. It will shatter into many pieces. (Wear safety goggles!) They will see that although it looks like a rock (chunks) it is very **brittle**! Next, tap a piece of lead or some other metal. While it will flatten out (malleable) and even stretch out into wire (ductile) it will not shatter. Finally, as another demonstration, take a metalloid (Silicon works very well) and test its conductivity. It does conduct electricity (Good place to mention Si chips in computers) and it is very lustrous. It even looks like a rock! However, if you tap it with a hammer, it will shatter into many pieces, just like sulfur. You may or may not want to use a chart like the one below. It is probably more useful to use it to summarize the physical properties they have just observed.

Sample	Metal or Nonmetal?	Luster: Shiny or Dull?	Malleable?	Ductile?	Conducts electricity?
Cu wire					
Cu foil					
Mg ribbon					
C (charcoal)					
Pb shot					
Pb sheet					

LEP Modifications:

- *Complete the first row of the above chart together as you model the activity.*
- *Have groups complete the activity while you walk around and monitor understanding.*
- *Come back together as a group and have students come up with their own definitions for luster, dull, malleable, and ductile. Have students put these definitions in their notebooks.*
- *Have students take turns saying the vocabulary words and their definitions orally to the class.*

EVALUATE:

Have students write a list of what they considered the 5 most important things they learned from the lab. Choose what they think was the most important and justify the reasoning.

Day 10- Structure and Properties of Matter

Essential Question: Why does the structure of matter influence the reactivity?

Language (ELP) Objectives for LEP students: The students will
-read and orally repeat laboratory instructions to the class.
-students will present their element advertisements to the class.

ENGAGE:
Ask students what they do to get ready for the day at school. What makes them feel prepared for their daily tasks? How do they feel if they are not prepared? How might this relate to chemical reactivity? (such as, Is the structure of the matter best suited for that type of reaction?)

EXPLORE:

Reactivity Lab Activity

Safety: Students will be working with chemicals; therefore, they will need to wear goggles, closed-toe shoes and aprons. MSDS for chemicals need to be reviewed prior to lab. Announce to students several days (each day) in advance of the clothing expectations.

Teacher Notes: Dilute the HCl so that you will see the Mg ribbon corrode away at a constant rate, but slow enough so that students have time to observe it reacting. It is recommended that only 3 or 4 ml of much diluted HCl be placed in each test tube. As far as element samples, use the same samples from the metals/nonmetals activity to save time and setup for yourself. Make sure students have safety goggles and keep baking soda around handy when working with acids, even much-diluted acids.

Reactivity Lab
Materials: Cu foil, Mg ribbon, Pb sheet, and solid chunks of C (charcoal), plastic Petri dishes, 4 test tubes with much diluted HCl, test tube racks, periodic table.

Place each of the four element samples in plastic Petri dishes. Before the students get the test tubes with the HCl, have them locate and circle the elements you are working with, Mg, Pb, Cu and C. Also identify the elements metals or nonmetals. Have students place each element slowly into each test tube of HCl. As each sample is lowered into the HCl, have students observe what is happening. It is recommended that they add the Pb, then the Cu and then carbon. They will notice a few bubbles coming off of the metals and nothing happening to the carbon. Have students record these observations in their notebooks. Before they add the Mg, have them reexamine the periodic table and the location of each of these elements. They will notice how the metals are on the right side while Mg is on the left side of the table. Have them predict what will

happen to the Mg when it is placed into the HCl. More often than not, some will predict that the Mg will behave differently than the other metals. Once it has been placed in the HCl, they will see the rapid corrosion f it and the gas given off. It will "disappear" very quickly! Now, have them recall how hard the metals were and how brittle the carbon was, physically. This is a great place to explain once gain that the physical properties of matter are not related to the chemical properties. Many expect the carbon to just "disappear" as the Mg does because of how hard the Mg was compared to the brittleness of the carbon. It is also a great place to have them determine where the most reactive metals are located on the table. Identify Francium as the most reactive metal and then fluorine as the most reactive nonmetal. Explain why; better yet, let them guess why the hydrogen is placed with the alkali metals. Ask them why gases such as neon are used in lighting? Why doesn't the gas explode when the electricity is run through it? This is a good way to lead into the inert noble gases. Also, discuss the reactivity of fluorine and the other nonmetals near it. You can touch on electronegativity if time allows as this topic would be enrichment, not required in the Standard Course of Study.

LEP Modifications:

- *Create a table like the one below.*
- *Write out (on the top of the data table) and read instructions to the class. Have them repeat the instructions back to check for understanding.*
- *Write out specific instructions. Like; using tweezers put the first metal slowly into the test tube. Record your observations in the table provided.*

Element	*Metal/Nonmetal*	*Physical Property of Sample*	*Observations of the sample in HCl*	*Chemical Property of Sample*	
Cu					
Mg					
C					

- *Have students turn to their group partners and explain the difference between physical and chemical properties.*
- *Have students turn to their group partners and show each other on their periodic table the location of the highly reactive metal and nonmetals.*

EXPLAIN:

Have students get into groups of two (if there's an odd number, you fill in) and do a 2-1-30 share about the Reactivity Lab just completed.

A 2-1-30 share is an easy way to facilitate discussion and explanation. Have groups decide who goes first. Then that person talks about the lab for 2 minutes, explaining concepts and talking about what happened. The other person cannot

talk during the 2 minutes…only listen. At the end of 2 minutes, the first person stops (even if it's mid-sentence) and the second person shares for 1 minute with the first person only listening. At the end of the 1 minute, the second person stops and the first person goes for 30 seconds to sum up what happened.

ELABORATE:

Element Advertisement Activity

Students can read the pages pertaining to properties of metals, nonmetals and metalloids in their text. They should then pick or the teacher can assign an element of their choice to research. One way to assign elements that works particularly well is to have students draw their element at random. Students then are to develop an "advertisement" that explains the advantages of their element. The advertisement should include the following: atomic number, average atomic mass, number of protons, neutrons, electrons, and reactivity. It should also include physical properties such as boiling points, melting point, malleability, luster, etc, real world uses. Basically, it should include whatever physical and chemical properties desired, especially those that are included in the SCOS. Students can use Power Point, Publisher or Word. They may write this or draw it. This is up to the teacher as far as the access of the class to these computer programs. It may also depend on whether students will work on this in class or out of class as a homework assignment or a longer term project. The teacher may tailor it to his/her particular classes and resources.

LEP Modifications:

- *Have students work in pairs. Explain what an advertisement is and give examples.*
- *Write out instructions on the board along with a check list that shows students what must be included in the assignment.*
- *Have students present their advertisements to the class.*
- *Have the students vote, choosing which element they would buy based on the advertisements.*

Day 11- Structure and Properties of Matter

Language (ELP) Objectives for LEP students: The students will
-write and orally describe the structure of an atom to their neighbors.

ELABORATE

Reactivity of Elements Activity

As students have become familiar with the reactivity in the reactivity lab, reinforce this concept with the independent practice comparing the reactivity of elements. Review the reactivity of metals (Fr most reactive) and any metal in its family/group and F is the most reactive nonmetal (halogens are most reactive nonmetals) with the Noble gases being inert. The following is an example of an independent practice to use.

LEP Modifications:

- *Complete the first few together as a class.*
- *Review reactivity trends on the periodic table.*
- *Have students complete the rest individually.*
- *When students are finished, exchange and grade as a class so students have immediate feed back.*

REACTIVITY PRACTICE

Which element in each pair is more reactive?

1. Fr or Na
2. K or Mg
3. Li or Be
4. Fr or Mg
5. F or He
6. Xe or I
7. Br or F
8. K or Li
9. Rb or Be
10. He or N
11. F or O
12. S or Cl
13. I or Ar
14. K or Rb
15. Cs or Na

Key: 1. Fr, 2. K, 3. Li, 4. Fr, 5. F, 6. I, 7. F, 8. K, 9. Rb, 10. N, 11. F, 12. Cl, 13. I, 14. Rb, 15. Cs

EVALUATE:

Structure of the Atom White Board Formative Assessment

Reinforce previous lessons with whiteboards to review the atomic number and number of protons, neutrons, and electrons

Have students read the parts of their text related to the structure of the atom, noting the location, charge and relative size of protons, neutrons and electrons. It will be good to have short discussion as to the structure of the atom after students have had time to record the specific information in their notes.

LEP Modifications:

- *Have students read the text in partners.*
- *Have students write the vocabulary words in their notes and have the partners come up with their own definitions of those words from the reading. Have students take turns sharing their definitions with the class*

Day 12- Structure of Matter

Essential Question: Why is the structure of matter useful?

Language (ELP) Objectives for LEP students: The students will
-listen to the instructions and the game calling for the game "ATOM".

ENGAGE:
Ask students, "What are atoms made of?" and "How do you tell how many of each type of particle there are?"

EXPLAIN:
Students should review how to determine numbers of subatomic particles in atoms in groups of two or three. Keep groups to those in close proximity to keep movement to a minimum.

EVALUATE:
Students play ATOM! to review/assess their knowledge of atomic structure.

LEP Modifications:

- *Write out instructions and have students read the instructions to their neighbor. Some students may not be familiar with BINGO.*
- *Model the first few turns.*

ATOM! Game Activity (Instead of BINGO)
With students aware of the charges of the protons and electrons, discuss the fact that the number of protons will be equal to the number of electrons in a neutral atom for any given element. For example, carbon has an atomic number of 6; therefore, it has 6 protons—and because carbon has 6 protons, it has to have 6 electrons in order to be neutral.

Students will pick up on this pretty quickly, and a good way to reinforce this is to play **ATOM!** It also can be used as a formative assessment measure.
Materials: card markers, **ATOM!** cards, periodic tables

Teacher notes: You can have the "bingo" covers or chips made by simply cutting up small pieces of construction paper and keeping them in a zip top bag. You may want to laminate the paper then cut it into ½" pieces to keep on hand. Another good suggestion for card markers is to use dried beans.

Students complete their own bingo-type cards. As students are still getting familiar with the periodic table, you control the numbers on the cards. It would be a good idea to make a class set of the blank cards and laminate them. Then the students could use overhead-type markers to fill in the card, and wipe off the card to change it.

For example, the first few times you play **ATOM!**, it is advisable to keep the numbers under 20. This way, students will only look at the first 20 elements. Students can put any number between 1 and 20 in the cells on their cards, without repeating any number. They play 4 corners, diagonal, straight across and up and down. When you call out the numbers, have a periodic table, a clean piece of paper and a writing utensil to record what you call out.

A	T	O	M

For example, you call out, "the # of protons in hydrogen." Put a marker down to cover the space that contains 1. It takes a while to get a winner and it is recommended that a winner clears their card while others do not. When a student has a bingo, they shout out, "ATOM!" You can check their numbers with what you have recorded on your paper. It is an easy, fun game that students tend to enjoy. It helps them learn where the elements are located while not just doing worksheets. As they progress in their knowledge, you can expand to atomic numbers, average atomic mass (rounded off) and then neutrons. Start out with atomic numbers and protons and electrons.

EXTENSION**:** You can make it more complicated by linking the numbers and columns…for example, call out "the # of protons in hydrogen, A." The student can only place a marker on the space that contains 1 **if it is in the A column.**

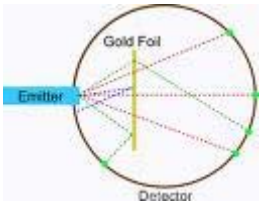
Day 13 – Review Structure and Properties of Matter

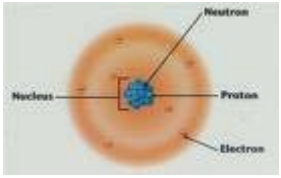
Day 14 – Test

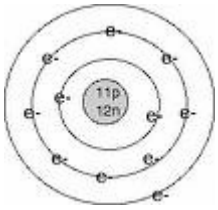
LEP Modifications:

- *Bold important words in the text: not, incorrect, Dalton, and Rutherford.*
- *Give students the periodic table that DPI will give during the EOC.*

Unit Four Sample Test Questions

Number	Competency or Objective	RBT Tag
5.01 Questions	Develop an understanding of how scientific process have led to the current atomic theory  www.nitrogenorder.org/lessons/nuclear/goldfoil.jpg Which of the following conclusions about the atom could not be drawn from Rutherford's gold foil experiment as represented above? a. The atom is mostly empty space. b. The atom is a solid particle. c. The nucleus of the atom is positively charged. d. The nucleus of the atom is its largest part. Which of the following statements in Dalton's atomic theory is incorrect base on current information? a. All atoms of an element have identical masses and properties. b. All matter is made of atoms. c. Chemical reactions involve a rearrangement of atoms. d. Elements combine in definite ratios to form compounds.	B2
5.02	Examine the nature of atomic structure: *protons *neutrons *electrons *atomic mass *atomic number *isotope	B2

Questions	 www.csmate.colostate.edu/cltw/cohortpages/viney/atom.jpg 1. Which of the following best describes why the electrons remain in the atom? a. A membrane holds the atom together. b. A strong force holds them in place. c. An electrical attraction exists between the negative protons and positive electrons. d. An electrical attraction exists between the positive protons and negative electrons. 2. Which of the following combinations represents Phosphorus-32? a. 15 protons, 15 neutrons, 15 electrons b. 15 protons, 17 neutrons, 15 electrons c. 15 protons, 32 neutrons, 17 electrons d. 15 protons, 17 neutrons, 17 electrons	
5.03 Questions	Identify substances through the investigation of physical properties: *density *melting point *boiling point 1. According to the table below, which of the following substances will float in water (density= 1.00 g/cm^3)? *Densities of Common Substances* Substance — Density Wood (oak) — 0.85 g/cm^3 Aluminum — 2.7 g/cm^3 Silver — 10.5 g/cm^3 Lead — 11.3 g/cm^3 a. aluminum b. lead c. silver d. wood	B3

	2. Which of the following substances is a solid at -10^{o}C? *Melting Points of Common Substances* Substance — Melting Point Hydrogen -259.3 ^{o}C Nitrogen -210.0 ^{o}C Ammonia -77.7 ^{o}C Water 0.0 ^{o}C a. ammonia b. hydrogen c. nitrogen d. water	
6.01	Analyze the periodic trends in the physical and chemical properties of elements. *groups *periods 1. Which of the following elements has an atom with the largest atomic radius? a. B b. N c. Ne d. Na 2. Which of the following is not true for the element represented below?  a. This element has a +1 oxidation number. b. This element will form an ion with a +1 charge. c. This element is found in group 1A. d. This element is found in period 4.	B4

Vocabulary List for ESL/EC students

LEP Modifications: The following are some example of ways to review vocabulary.

- *Chunk the vocabulary by activity/day. Review vocabulary every day.*
- *Word walls are a great resource for students.*
- *Have students create their own definitions and record them in their notebooks.*
- *Copying definitions out of the text usually does not teach them understanding.*
- *Have students use the vocabulary words in a sentence and share with their neighbor.*
- *Have students create flash cards and have them quiz their neighbors.*
  - *Have students create a memory game with their flash cards.*
- *Have students create a flow chart or bubble map using vocabulary words.*

Vocabulary List Unit Four

matter
mass
volume
physical property
physical change
chemical property
chemical change
density
state / phase of matter
solid
liquid
gas
plasma
melting
freezing
freezing point
vaporization
boiling point
condensation
sublimation
deposition / crystallization
atom
element
proton
neutron
nucleus
strong nuclear force
electron
valence electron
energy level

electron cloud
isotopes
periodic table
periodic law
atomic number
atomic mass
mass number
period
group / family
reactivity
metal
nonmetal
metalloid
alkali metals
alkaline earth metals
halogens
noble/inert gases

Note: You may wish to alphabetize this list if giving it to the students.