Lesson Title	If My Configurations Are Correct…
Length of Lesson	1 hour 15 min
Created By	Chris Ruhs
Subject	Chemistry
Grade Level	10-12th Grade
State Standards	Chemistry I: 3d,e,f
DOK Level	DOK 2
DOK Application	Students demonstrate their knowledge of Bohr's model, Lewis dot diagrams, and electron configurations to several elements at ground state.
National Standards	9-12: B (Physical Science)
Graduate Research Element	Understanding electron configurations, valence electrons, and ionization is critical for any chemistry, and helps biogeochemists predict how elements and compounds will behave, react, and move through the environment.

Student Learning Goal:

MS 9-12th Grade:

Chemistry I: 3 (d) Write the electron configurations of elements. (e) Draw the electron-dot (Lewis) structure of elements. (f) Predict the charge of an ion based on the element's valence electrons. *Students will learn and apply Bohr's model, Lewis dot diagrams, and electron configurations to elements at ground states and stable ions.*

National Science Education Standards of Content 9-12:

B: Physical Science: Stucture of atoms. Structure and properties of matter. *Students will learn how the arrangement of electrons relates to valence electrons, formation of ions, and the arrangement of the elements on the periodic table.*

Materials Needed (supplies, hand-outs, resources):

Lesson Performance Task/Assessment:

Formative:

1. Hand out the worksheet at the beginning of class with problems relating to Bohr's model, Lewis dot diagrams, and electron configurations for different elements in their ground states. Allow students to work on this worksheet while the following material is being presented.
2. Discuss the atom, how it's shaped, how subatomic particles behave and are arranged. Talk about how the nucleus is a concentration of positive and neutral charges held tightly together by the strong force, and negatively charged electrons are attracted to this nucleus by the electromagnetic force.

3. Overview Bohr's model as one way to represent an element, showing all the electrons on different orbits around the nucleus. Tell the students that this model is incorrect, but useful.
4. Tell the students that in chemistry we are mostly interested in an element's "valence electrons" which are the number of electrons on the highest energy level. Unless it's a transition metal, a lanthanide, or an actinide, these are the only electrons in play for chemical reactions. Introduce Lewis dot diagrams.
5. Introduce electron configurations to the students as a means of identifying each electron within an element. Relate electron configuration to the periodic table, to Bohr's model, and to Lewis dot diagrams.
6. Allow students some time to finish their worksheets, helping them individually as they have questions.

Summative:

1. Split the class into two groups.
2. Let two students from each group go up to the board to compete in demonstrating a correct Bohr model, Lewis dot diagram, or electron configuration for the ground state of an element.
3. The first team to get the question correct gets a point for their team and must explain why their answer is correct.

Lesson Relevance to Performance Task and Students:
Reviewing Bohr's model, Lewis dot diagrams, and electron configurations, and tying the three to the layout of the periodic table will build an understanding of how electrons, especially valence electrons, behave in the atom. The goal here is to give the students a robust, working understanding of atoms, upon which all future information can be scaffolded. This information will immediately be called into use for the activity.

Anticipatory Set/Capture Interest:
An eye to eye (sitting in a seat in front of the class) explanation of the nature of atoms and their subatomic particles will get their attention. This conversation can draw upon visual language, "if the nucleus of that atom were about the size of a basketball, the nearest electron would be 8 miles away" as well as interesting questions, "if identical charges repel each other, how can there be all these protons packed into a tiny nucleus and all these negative charges filling the space around the nucleus?"

Mentioning that there will be a game at the end of class might also get them interested.

Guided Practice:
Conversation and lecture coupled with the worksheet will act as guided practice.

Independent Practice:
Students will work in teams to demonstrate correct understandings of Bohr's model, Lewis dot diagrams, and electron configurations for the ground states of different atoms and ions.

Remediation and/or Enrichment:
Remediation:
Individual IEP, focus on one model at a time, just discuss valence electrons.

Enrichment: segue into energy levels, orbital shapes (probability volumes), and quantum numbers.

Check(s) for Understanding:
What is the electron configuration of Sn?

What's the easiest way to find out how many electrons fit in a given energy level?

If opposite charges attract, and identical charges repel, how can there be a concentration of positive charges in the nucleus (protons), and a build up of negative charges in the electron cloud (electrons)?

Closure:
A student-lead, teacher-guided summary discussion will bring closure to the lesson plan.

Possible Alternate Subject Integrations:
Biology: biofluorescence, ions/electrolytes
Chemistry: ions, energy levels, quantum numbers, bonding, etc.
Physics: ionization energy, spherical harmonics,

Teacher Notes:
This subject is intensely confusing if not related to the periodic table and supplemented with visual language.