Lesson 1-3: Electron Configuration & Blocks of the Periodic Table	
Curriculum Expectations	C3.2: identify the characteristic properties of elements in each of the *s*, *p*, and *d* blocks of the periodic table, and explain the relationship between the position of an element in the periodic table, its properties, and its electron configuration C2.2 use the Pauli exclusion principle, Hund's rule, and the Aufbau principle to write electron configurations for a variety of elements in the periodic table [AI, C] C3.2 describe the electron configurations of a variety of elements in the periodic table, using the concept of energy levels in shells and subshells, as well as the Pauli exclusion principle, Hund's rule, and the Aufbau principle
Learning Goals	**Learning Goals:** By the end of this lesson you will: • Understand the Afbau Principle • Be able to draw Afbau Diagrams • Apply the Afbau principle to writing electronic configurations and drawing orbital diagrams • Understand the connection between electron configuration and blocks of the periodic table
Success Criteria	**Success Criteria:** I know I have achieved the learning goals when I: • Can reproduce and explain an Afbau diagram • Can write out electronic configurations and draw orbital diagrams for any element in the periodic table • Can identify blocks of the periodic table by their placement within it, their electron configuration and their characteristics

Teacher Prep	• Bring materials for Electron Configuration Battleship
	  ○ 1 file folder per student
	  ○ 2 periodic tables per student
	• Check to make sure interactive periodic table from activity 1-3B works.
	• Check to make sure interactive periodic table from the Graphing the periodic table group activity works.

	• Print out handout if you want students to fill it out as they progress through the lesson. • Paper for placemat activity.

Minds On

Goal: To refresh information and concepts related to the periodic table.

1. <u>Periodic Table Placemat Activity</u>

- Begin the lesson by organizing students into groups of 3-4.
- On a blank sheet of paper create an organizer as shown in the module.
- Each student will be assigned a space.
- Read the prompt to the class and make sure they understand the prompt.
- There are no right or wrong answers to this, the goal is to get students thinking about the periodic table.
- Have students discuss their thoughts with the group and find the points that they all agree with and discount points that they believe to be incorrect.
- Compile the agreed upon responses in the center of the paper.
- Teacher will then pull responses from each group, compiling responses on the board and leading a discussion related to the students previous knowledge of the periodic table.

Action

1. Electron Configuration & Orbital Diagram Handout

Have students complete the handout as they work their way through the lesson *or* you can assign the handout as homework to completed after class and taken up in the next session.

2. 1-3A: Electron Configuration and Orbital Diagrams

- Use the slides from the differentiation resources (Link: https://pokoradi.wikispaces.com/file/view/4%20-%20Electron%20Configuration.pdf/541141150/4%20-%20Electron%20Configuration.pdf) to lead a presentation on these concepts, reviewing important concepts and identifying any misconceptions. Stop the presentation before you reach the section on Hund's Rule.
- Have students read through sections A & B on their own.
- Take up the answer to question 1-3A-1
- You can have students practice drawing their own Aufbau diagrams after.
- Follow this by using the slides from the presentation relating to Electron Configurations & Orbital Digrams and Hund's Rule.
- Next have students read sections C and D on their own.
- Take up the answers to embedded questions.

- Follow up by asking the students if there are any questions on these topics.

3. Electron Configuration Battleship

- Pair the students up and hand out the materials for the battleship game.
- Explain the rules of battleship. Use the embedded pdf if necessary. You can also introduce the game by playing a commercial for the game.

Playing the Game

- The game is played like traditional battleship in pairs of two. Each student has a file folder open so that the opponent cannot see either of his/her periodic tables.
- Each player will layout their battleships by drawing lines (or placing an object) across elements on the periodic table according to the following criteria:
- An aircraft carrier (5 elements)
- A battleship (4 elements)
- A destroyer (3 elements)
- A submarine (2 elements)

    - The first player calls a valence configuration for an element of his/her choice, for example, Carbon would be $2p^2$, and the other player states the name of the element called (in order to verify understanding of the "code" between the players), and then says "hit" or "miss".
    - The player stating the configuration marks the top periodic table to note shots taken, and the player being "shot at" marks hits and misses on the bottom periodic table.
    - Play continues until all ships are sunk

4. Graphing the Periodic Table Group Activity

1. Open the interactive periodic table https://www.pbslearningmedia.org/asset/lsps07_int_graphperiodic/
2. Show students the different features of the table
3. Focus on the tabs at the top, especially Plot Data.
4. In groups have students answer the following questions:

    - Explore the linear plot of molar mass versus atomic number. Why do the elements become heavier as atomic number increases?
    - Next, look at atomic radius. What patterns do you notice? What do you think causes these patterns? For example, why is F smaller than Li?
    - Is there a relationship between atomic radius and electronegativity/ionization energy?
    - Display the Alkali Metals labels. What properties peak in these elements? What properties are minimized in these elements?

- How does the arrangement of elements in the periodic table enable the user to identify an unknown element?

5. Have groups record their answers.
6. Each group will present their responses and engage in a class discussion after.

5. 1-3B: Periodic Table Blocks Investigation

This learning activity is meant to allow students to investigate the periodic table, to see how elements are organized and to observe any patterns relating to electron placement.

- Have students open or printout the file Blocks of the Periodic Table Handout.
- Open the interactive periodic table and display it for all students to see. Demonstrate some of the features of the table, showing students how they might explore.
- Students will complete the investigation on their own and answer all questions on the handout.
- Alternatively, you can put the interactive periodic table on a screen and lead the investigation as a class.
- Circulate among the students as they complete the investigation to help clear up any misconceptions.

1-3C: Blocks of the Periodic Table

- Use this resource as a review and checkup of the student investigation from activity 1-3B.
- Emphasize that the blocks are divided up based on their valence electron configurations and that the periodic table has several levels of organization within it.

Consolidation

1. **1-3D: Building Atoms interactive.** This activity allows students to practice electron configurations and refresh information about orbitals. This activity may be completed individually or as a class.

2. **1-3E: Quiz** Students complete the quiz individually on their own in class or at home. Once all students have completed the quiz, take up the answers as a class.

3. **1-3F: Electron Configuration Practice Worksheet.** To be completed individually, in class or at home. Take up the answers together the following day.

4. **1-3G: Electron Configuration & Blocks of the Periodic Table Assignment**
   - This is a graded assignment.
   - Review the expectations with the class, highlighting where marks are allocated.

- This assignment is meant to be completed individually, without input from the teacher on the nature of the answers.
- Clear up any misconceptions or questions about the assignment before students begin.
- This assignment should be completed outside of class.
- Emphasize that written answers must be written in full sentences, using mature, scientific terminology.