



Lesson Title	Code Makers - Electron Configuration, Aufbau Principle
Length of Lesson	30 minutes
Created By	Lucas Pounders
Subject	Physical Science
Grade Level	10 th -12 th
State Standards	Physical Science 1b,f; 4b; 5a,c
DOK Level	3
DOK Application	Formulate
National Standards	9-12 Science as Inquiry
Graduate Research Element	Organization

Student Learning Goal:

This lesson is designed to help students to understand the benefits of using the Aufbau, or building up, principle. This will be done through the use of a lecture and 'code breaking and making' activity. Also there is to be discussion problems with understanding the principle.

State Standards

1. Apply inquiry-based and problem-solving processes and skills to scientific investigations.

- b. Identify questions that can be answered through scientific investigations.
- f. Formulate and revise scientific explanations and models using logic and evidence (data analysis).

4. Develop an understanding of the atom.

- b. Explain the difference between chemical and physical changes and demonstrate how these changes can be used to separate mixtures and compounds into their components.

5. Investigate and apply principles of physical and chemical changes in matter.

- a. Write chemical formulas for compounds comprising monatomic and polyatomic ions.
- c. Classify types of chemical reactions (e, g., composition, decomposition, single displacement, double displacement, combustion, acid/base reactions).

National Standards

9-12: Science as Inquiry Standards: Understanding about scientific inquiry



*The Aufbau Principle is an established principle explaining how to map electron configuration in an atom.

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

White Board and Marker

Thorough knowledge of the Aufbau Principle

Patience

Lesson Performance Task/Assessment:

Ask the students if they know of any types of code used in today's world. Take into consideration all of the types of codes that the students are aware of and ask them what and how they know of them. Relate this information to the use of codes in science. All codes have to be written and broken and the same goes for the many codes used in science. One of these codes is the Aufbau Principle. The Aufbau Principle uses a series of letters and numbers to write a code for the amount of electrons in an atom. All atomic elements are found in the periodic table where a code can be taken from the atomic number to find out what the number of protons and electrons are in any given stable atomic element.

The first step:

Introduce the students to their "Code Key" in two parts.

Part 1) Tell them that they will be using 4 letters S, P, D, and F.

S = 2, P = 6, D = 10, and F = 14

Part 2) Show them how to build their 'Key'.

Tell them to build 5 columns.

The first column holds the numbers 1,2,3,4,5,6,7, and 8.

The second holds 8 S's.

The third skips the first row and holds 7 P's.

The fourth skips the first two rows and holds 6 D's.

The fifth skips the first three rows and holds only 2 F's.

This should lead the students to the following chart:

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1 S
2 S P
3 S P D
4 S P D F
5 S P D F
6 S P D
7 S P D
8 S P D
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This is the chart that will be filled from top to bottom with the number of electrons. For example, Iron found on the periodic table of elements holds 26 electrons. The chart would be filled in the following manner.



1S↑↓
 2S↑↓ P↑↓ ↑↓ ↑↓
 3S↑↓ P↑ ↑

The ↑ electrons are filled in after each letter before the ↓ electrons after the same letter. This same amount of electrons would yield the formula,

$$1S^{2} 2S^{2} P^{6} 3S^{2} P^{2}$$

Lesson Relevance to Performance Task and Students:

At a later date the students will be tested on their ability to perform electron configuration using the Aufbau Principle.

Anticipatory Set/Capture Interest:

In order to capture the interest of the students they will be asked to give real life examples of codes that they use every day. If they do not have any examples it will be the instructors duty to provide them with a few examples to help them come up with their own examples. These examples will then be discussed and linked with the example of the Aufbau Principle.

Guided Practice:

After the Principle has been explained with a couple of example, the students will be asked to perform the task on a couple of elements from the periodic table.

Independent Practice:

Students can be assigned homework in the of performing the Aufbau principle on a part of the periodic table to be turned in for a daily homework grade.

Remediation and/or Enrichment:

Follow student IEP. Students needing extra assistance should be given additional tutoring on the topic.

Check(s) for Understanding:

Work with the students one on one if possible to assess their understanding of Aufbaus principle. A student should be able to memorize the number of electrons to assign to each letter and build the 'Key' on their own.

Closure:

Students will have to build the 'Key' for the Aufbau Principle and turn it in at the end of the class period. They can also be given an element and the key to perform the Aufbau Principle on and turn that in by itself or with the 'Key.'

Possible Alternate Subject Integrations:

INSPIRE GK12 Lesson Plan



Chemistry, Physical Science, Physics, Biology, Botany

Teacher Notes:

Always be sure to know the material that you are presenting and make a dry run through your lectures before trying to attempt them in class. Do not be afraid to substitute and improvise as needed.