K20 LEARN

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Periodic Shuffle

Introduction to Periodicity and Electron Configuration

K20 Center, Bj Sneed, Teresa Randall, Alexandra Parsons
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Grade Level	9th – 12th Grade	**Time Frame**	2-3 class period(s)
Course	Chemistry, Physical Science	**Duration**	135 minutes

Essential Question

How do patterns allow for making predictions? How can the periodic table be used to make predictions about the properties of elements?

Summary

In this lesson, students will learn how to predict electron configuration and valence electrons by exploring patterns within the periodic table. Students will discover that elements are arranged in increasing order of their atomic number in the periodic table, and then the elements repeat their properties after a definite interval. As a prerequisite to this lesson, students should be able to read electron configurations.

Snapshot

Engage

Students predict missing portions of a ROYGBIV visual table.

Explore

Students investigate the electron configuration patterns of the periodic table.

Explain

Students color in a periodic table to reflect the patterns they found.

Extend

Students investigate the valence electrons patterns of the periodic table.

Evaluate

Students write a Word Splash about what they have learned.

Standards

ACT College and Career Readiness Standards - Science (6-12)

IOD202: Identify basic features of a table, graph, or diagram (e.g., units of measurement)
IOD302: Understand basic scientific terminology
IOD304: Determine how the values of variables change as the value of another variable changes in a simple data presentation
IOD403: Translate information into a table, graph, or diagram
EMI201: Find basic information in a model (conceptual)
EMI301: Identify implications in a model
EMI603: Use new information to make a prediction based on a model

Next Generation Science Standards (Grades 9, 10, 11, 12)

HS-PS1-1: Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.

Oklahoma Academic Standards (Physical Science)

CH.PS1.1 : Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.

Oklahoma Academic Standards (Physical Science)

PS.PS2: Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.
PS.PS1.1.1: Each atom has a charged substructure consisting of a nucleus, which is made of protons and neutrons, surrounded by electrons.
PS.PS1.1.2: The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states.

Attachments

- Electron Configuration Cards—Periodic Shuffle - Spanish.docx
- Electron Configuration Cards—Periodic Shuffle - Spanish.pdf
- Electron Configuration Cards—Periodic Shuffle.docx
- Electron Configuration Cards—Periodic Shuffle.pdf
- Explore—Periodic Shuffle - Spanish.docx
- Explore—Periodic Shuffle - Spanish.pdf
- Explore—Periodic Shuffle.docx
- Explore—Periodic Shuffle.pdf
- Lesson Slides—Periodic Shuffle.pptx
- Periodic Table—Periodic Shuffle - Spanish.docx
- Periodic Table—Periodic Shuffle - Spanish.pdf
- Periodic Table—Periodic Shuffle.docx
- Periodic Table—Periodic Shuffle.pdf
- Valence Electrons—Periodic Shuffle - Spanish.docx
- Valence Electrons—Periodic Shuffle - Spanish.pdf
- Valence Electrons—Periodic Shuffle.docx
- Valence Electrons—Periodic Shuffle.pdf

Materials

- Lesson Slides (attached)
- Explore handout (attached; 1 per student)
- Electron Configuration Cards (attached; 1 card per group of three students)
- Valence Electrons handout (attached; 1 per student)

- Periodic Table handout (attached; 1 per student)
- Class periodic table (large enough that a sticky note should fit inside each square)
- Colored pencils or markers
- Sticky notes (1 stack per group of three students)

10 minutes

Engage

Use the attached **Lesson Slides** to guide the instruction. Display **slide 2** and provide an introduction to the lesson. Point out the word "periodicity," and share the following definition with students: *Periodicity is the repetition of something after a certain interval*. Consider asking students if they can think of some things that occur at regular intervals. Possible responses might include a full moon occurring about every 29 days, a year occurring every 365 days, or a day occurring every 24 hours. In chemistry, periodicity refers to the recurring trends that are seen in the properties of elements.

Teacher's Note

Consider reviewing electron configuration if it has been some time since students have used that information.

Share the essential questions with students on **slide 3.** Go to **slide 4** and go over the learning objectives. Go to **slide 5,** and give students a few minutes to consider how they would fill in the missing parts of the grid and why. Have some students share what they are thinking and how they came to that conclusion.

Teacher's Note

As students engage with the ROYGBIV table, they should begin constructing knowledge about how to identify and analyze patterns.

Go to **slide 6**. The correct answer is the image on the right. Point out the patterns.

The patterns in the ROYGBIV table are similar to the periodic table which will be explored throughout the lesson. The horizontal pattern in the ROYGBIV table is analogous to the electron configuration in the periodic table, while the vertical pattern is analogous to the valence electrons.

45 minutes

Explore

Lesson Preparation

Print out the attached **Electron Configuration Cards**. Cut out each card and prepare to distribute one card to each student group. Consider printing the cards on card stock or laminating them to reuse them for other classes.

Additionally, be sure to display a large periodic table in an easily accessible spot for students to interact with.

Go to **slide 7**. Put students into groups of about three, and pass out one of the attached **Explore** handouts to each student. Next, give each group one Electron Configuration Card and a pad of sticky notes.

Teacher's Note

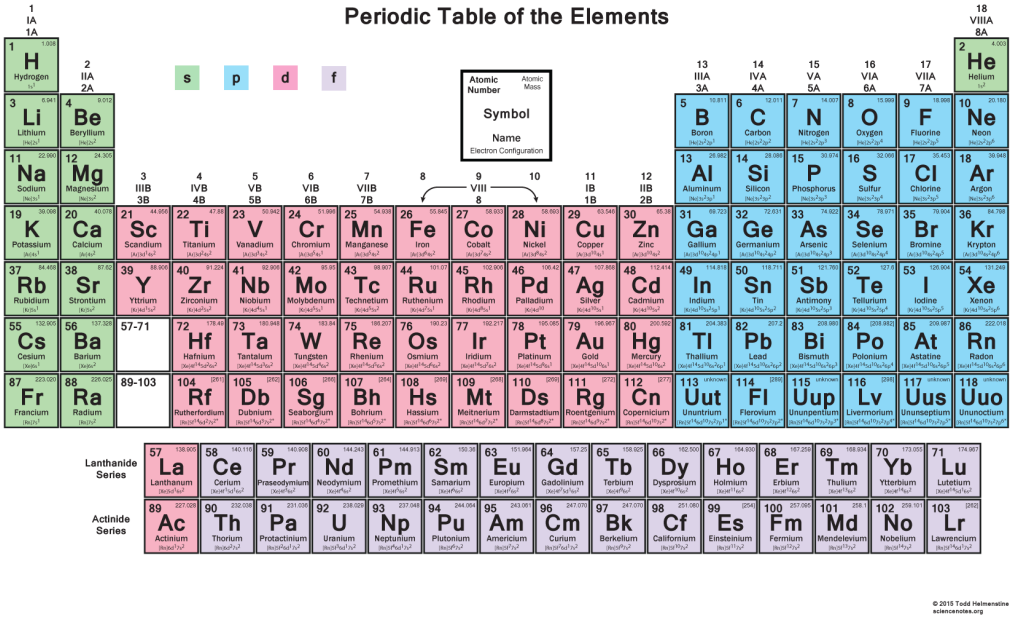
If you have more than eight groups, make additional copies of the Electron Configuration Cards document, and assign the same cards to more than one group.

Have students work on the Explore handout, including having students putt sticky notes on the classroom-size periodic table.

15 minutes

Explain

Go to **slide 8**. Pass out one of the attached **Periodic Table** handouts to each student. Let students pick four colors of markers or colored pencils. Based on what they learned in the Explore activity, have the students color the s, p, d, and f blocks four unique colors in their handouts. Remind them to add a legend indicating which color represents which block.



This is an example of what is meant about coloring in the periodic table using the orbital predictions of a guide based on what part of the periodic table corresponds to which orbital type.

30 minutes

Extend

Go to **slide 9.** Pass out one of the attached **Valence Electrons** handouts to each student. Have students return to their groups from the Explore activity and ask them to complete the handout. This time, students should work with their group to write the number of valence electrons they determined for each group on the sticky notes. Have students place their sticky notes over each group.

10 minutes

Evaluate

Go to **slide 10**. Have students participate in a Word Splash activity, using all of the words listed to write synthesis statements connecting all the words.

- Electron configuration
- Periodic table
- Valence electrons
- Electron orbitals
- s, p, d, and f orbitals

Sample Student Response

The periodic table predicts electron configuration and number of valence electrons and can be grouped by s, p, d, and f orbitals.

Resources

- K20 Center. (n.d.). Word splash. Strategies. https://learn.k20center.ou.edu/strategy/199