Collisions Lesson Plan

Electron Configuration

Time: 1 -2 class periods

Lesson Description

In this lesson, students will use Collisions to explore electron configuration, Hund's Rule, and the Aufbau Principle.

Key Essential Questions

1. How are electrons organized around the atom?
2. Is there a pattern that is followed to fill the electron orbitals surrounding the atom?

Learning Outcomes

Students will predict the electron fill order and electron configuration of atoms on the periodic table.

Prior Student Knowledge Expected

In an atom, the number of protons = the number of electrons.

Lesson Materials

- Individual student access to Collisions on tablet, Chromebook, or computer.
- Projector / display of teacher screen
- Accompanying student reources (attached)

Standards Alignment

NGSS Alignment		
Science & Enginnering Practices	Disciplinary Core Ideas	Crosscutting Concepts
• Developing and Using models • Construcing explanations and designing solutions	• **HS-PS-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.	• Cause and Effect: Mechanism and Prediction

PART 1: Explore (15 minutes)

Summary

This is an inquiry-driven activity where students play a few game levels and begin making observtions. tudents will complete a few levels in the Atoms Sandbox to begin to observe the sequence of electron filling (Hund's Rule, Aufbau Principle) and electron configuration.

Activity

1. Direct students to log into Collisions with their individual username and password.
2. Students should enter the Atoms game and play Levels 1 - 5.
3. Ask students to answer the following questions during gameplay:

- If there are 8 protons in an atom, how many electrons do you need to add?
- How many electrons can be placed into 1 circle (orbital)?
- Did you observe a pattern when adding electrons? If so, describe this pattern.

PART 2: Explain (15 minutes)

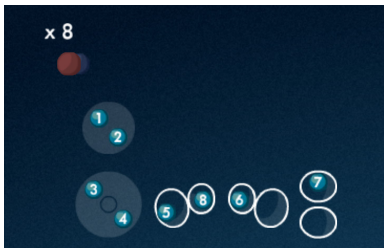
Incorporate the following information into your instruction:

Explain to students that the pattern they have just observed in the introduction activity has to do with **electron configuration**.

Introduce **Hund's Rule.**

The most stable arrangement of electrons in a subschell occurs when the maximum number of unpaired electrons exists.

Correct



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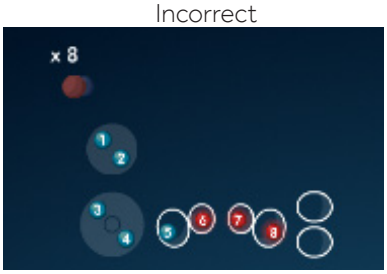
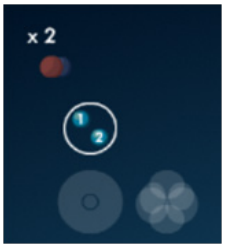


Introduce the **Aufbau Principle.**

Electrons fill the lowest available energy levels first, before filling higher levels.

Correct



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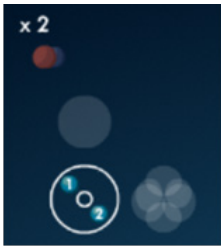
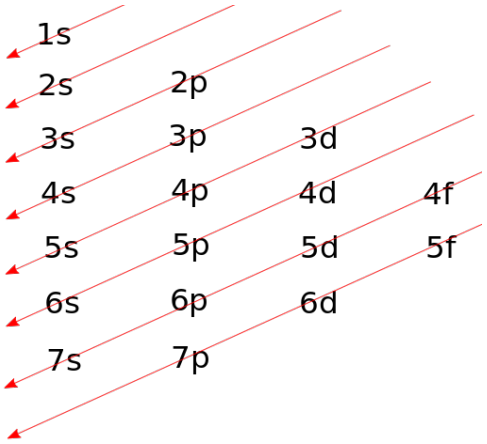


PART 2: Explain cont. (15 minutes)

Compare the **Collisions atomic orbitals** to the **electron configuration pyramid** and introduce the labeling of orbitals.



Practice writing some electron configuration examples together as a class before moving into the extend.

PART 3: Exend (30 minutes)

Summary

Students will use the Atoms Sandbox to continue to practice the concept of electron configuration and fill order. In this activity, sutdents will build atoms based on a given electron configuration as well as determine the electron configuration of a given atom. Feel free to have your students partner up to master these challenges!

Activity

1. Direct students to log into Collisions with their individual username and password.
2. Students should enter the Atoms Sandbox.
3. Provide your students with the **Build It, Configure It!** worksheet.

PART 4: Evaluate (5 minutes)

Summary

Students will complete an independent exit ticket to show their knowledge of electron configuration.

Activity

Provide students with the **Check for Understanding Atoms** worksheet.

Electron Configuration Student Activity

BUILD IT, CONFIGURE IT!

Name: _____

DIRECTIONS: Complete the following activity to extend your knowledge and practice of electron configuration.

Part 1: Given the electron configuration, build the correct atom in Collisions.

Electron Configuration	What is the atom?	# of electrons
$1s^2 2s^2 2p3$		
$1s^2 2s^2 2p^6 3s^1$		
$1s^2 2s^2 2p^5$		
$1s^2 2s^2 2p^6 3s^2 3p^4$		
$1s^2 2s^2 2p^6 3s^2 3p^2$		
$1s^2 2s^2 2p^5$		
$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$		
$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^7$		
$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^3$		
$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^1$		
$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^{10}$		

Part 2: Given the atom, build it in Collisions and determine the electron configuration.

Atom	# of electrons	Electron Configuration
He		
Ca		
P		
Br		
Si		
Mn		
Sr		
Al		
N		
Cs		

Part 3: Complete the challenge below!

1. What is the largest atom that you can build in Collisions?

2. What is the electron configuration of the atom?