This activity is meant to extend your students' knowledge of the topics covered in our Chemicals of Innovation lab. Through this activity your students will develop a greater familiarity with the Periodic Table of Elements.

**Grades 5-8**

**Estimated Time:** 10 minutes to put together; 20-30 minutes to play

**Student Outcomes:**
1. Students will be able to identify elements of the periodic table by their atomic symbol and their position in the table (group and period numbers)

**Vocabulary**

**Familiarity with these terms and concepts will enhance students' experience in the activity**

- **Atomic symbol:** the atomic symbol is a one or two letter abbreviation for an element.
- **Atomic mass:** the average mass of an element—the amount of protons plus neutrons.
- **Atomic orbital (also called a shell or energy level):** the area surrounding the center of an atom where electrons are found. Each orbital can hold a certain number of electrons. More orbitals means there are more electrons.
- **Period:** rows on the periodic table. Elements in the same period have the same number of atomic orbitals. (Period 1 (row 1) has only 1 orbital; Period 2 (row 2) has 2 orbitals; etc.)
- **Valence Electron:** an electron in an atom's outer orbital (or energy level) that is able to bond with other atoms.
- **Group:** columns on the periodic table. Elements in the same group have the same number of valence electrons and act similarly.

**Materials**

- 2 periodic tables per student (provided)
- 1 manila folder per student
- 1 dry erase marker per student
- Stapler or tape

**To make the “game board”**

1. Laminate and trim all periodic tables.
2. Hand out 2 periodic tables and 1 manila folder to each student.
3. Staple or tape one periodic table to each side of the folder so that both tables are upright when the folder is open horizontally.

**Game Play**

1. Before playing, review the above vocabulary terms with students. Give examples of each term with the periodic table at hand so students can reference it.
2. **Atomic orbital**—start with an easy element, Hydrogen. Hydrogen has one electron, so it only has one orbital. Hydrogen is in the first

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**Periodic Table Battleship**

**Lab Related Activity: Chemicals of Innovation**

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**Game Play**

1. Before playing, review the above vocabulary terms with students. Give examples of each term with the periodic table at hand so students can reference it.
2. **Atomic orbital**—start with an easy element, Hydrogen. Hydrogen has one electron, so it only has one orbital. Hydrogen is in the first
row (also called Period) on the periodic table because it has one orbital.
   a. Orbitals can only hold a certain number of electrons
      • The first orbital can only hold up to 2 electrons
      • The second and third orbitals can hold up to 8 electrons
      • Fourth and above orbitals can hold up to 18 electrons.
   b. Orbitals do not need to be full.
   c. Elements with the same number of orbitals are in the same period or row.
3. Valence Electron - valence electrons are the electrons in an orbital that are able to bond with other atoms.
   Electrons in an orbital can bond with other atoms if the orbital is not full.
   a. Begin with hydrogen as an example again. Hydrogen has only one electron in its one orbital. Since the first orbital can hold 2 electrons, the orbital is not full. That one electron is considered a valence electron since there is room for additional electrons. If an atom’s outermost orbital is full, it does not have any valence electrons.
   b. Elements with the same number of valence electrons are in the same group or column on the periodic table.
4. After reviewing the terms, have students label their periodic tables with the terms Group and Period.
5. To play the game, each player should use their dry erase marker to circle a series of elements on the bottom periodic table—this is their game board. (Same basic rules as regular Battleship)
   a. Students should circle 5 “ships” of different element lengths on their board. “Ships” cannot go diagonally across the periodic table; they must be vertical or horizontal.
   b. Ships should be the following lengths:
      • 2 elements
      • 3 elements
      • 2 that are 4 elements
      • 5 elements
   c. Once “ships” are selected, players take turns asking their opponent possible positions for their “ships.” Players should ask in the form of Period #, Group # or by asking for atomic symbol.
   d. Players should mark off when they hit or miss their opponent’s “ships” on the top periodic table. Players can choose their own marks for hit or miss.
   e. If a player’s “ship” is hit, the player should write an X over the element that the opponent has called.
6. The game is over when a player has sunk all of the opponent's “ships.”
Periodic Table Battleship
Lab Related Activity: Chemicals of Innovation

Examples of Elements in the Same Period (same # of orbitals)

- Lithium: Period 2; 2 orbitals
- Carbon: Period 2; 2 orbitals
- Neon: Period 2; 2 orbitals

Examples of Elements in the Same Group (Same # of valence electrons)

- Lithium: Group 1; 1 valence electron
- Sodium: Group 1; 1 valence electron
- Potassium: Group 1; 1 valence electron

201 S. Market St.
San Jose CA. 95113
1-408-294-8324
thetech.org