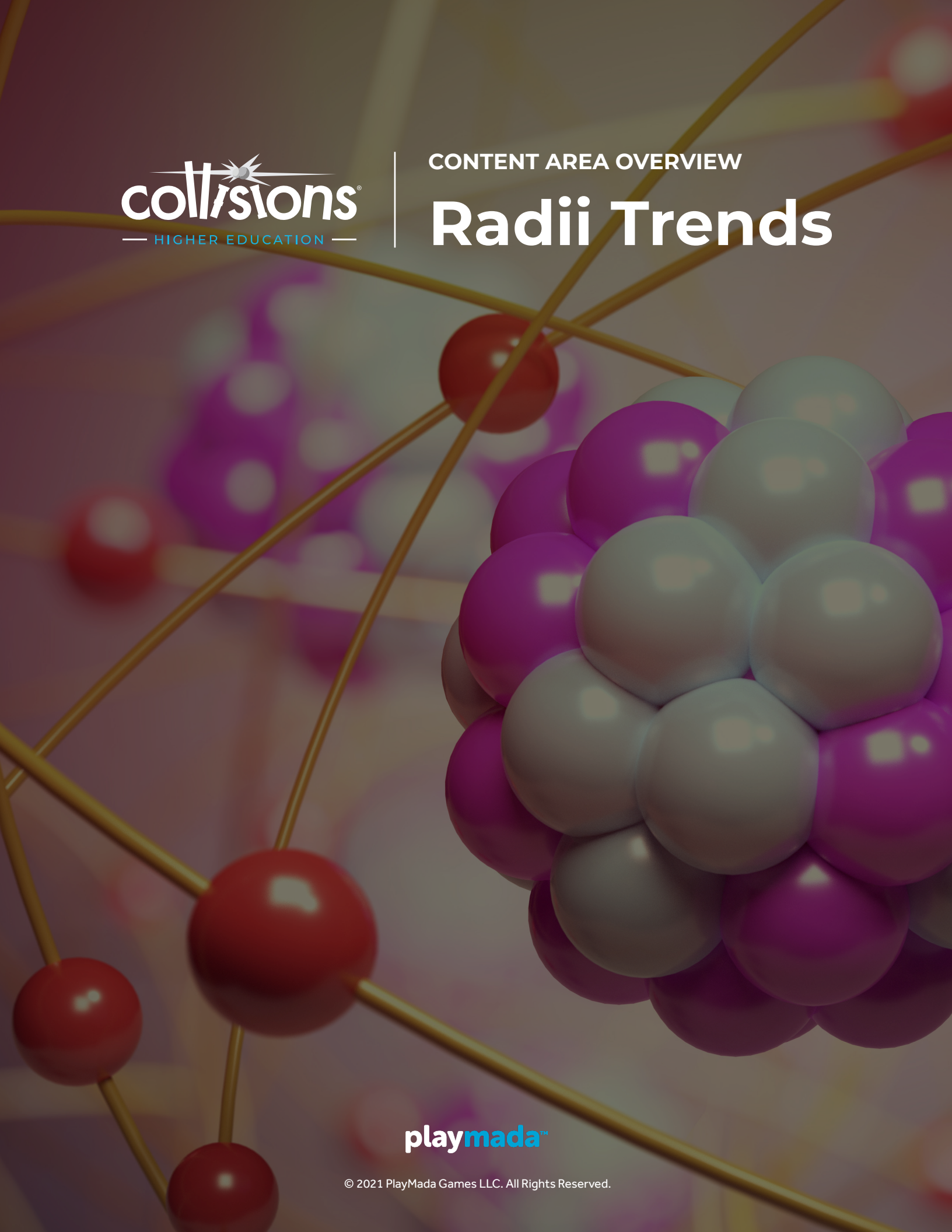


collisions HIGHER EDUCATION

CONTENT AREA OVERVIEW

Radii Trends

playmada™

SNAPSHOT

Challenges

- Thirteen Challenge Levels
- Levels increase in rigor and complexity
- The first 5 levels are Tutorial levels.

Sandbox

- The Sandbox is an exploratory learning space for extended practice and review of atoms.
- Twelve achievements

Integrated Chemistry Concepts

- Atomic Neutrality
- Electron configuration
- Aufbau Principle
- Hund's Rule
- Periodic trends: atomic size, electronegativity

GAMEPLAY BASICS

PROTONS ADDED TO ATOM

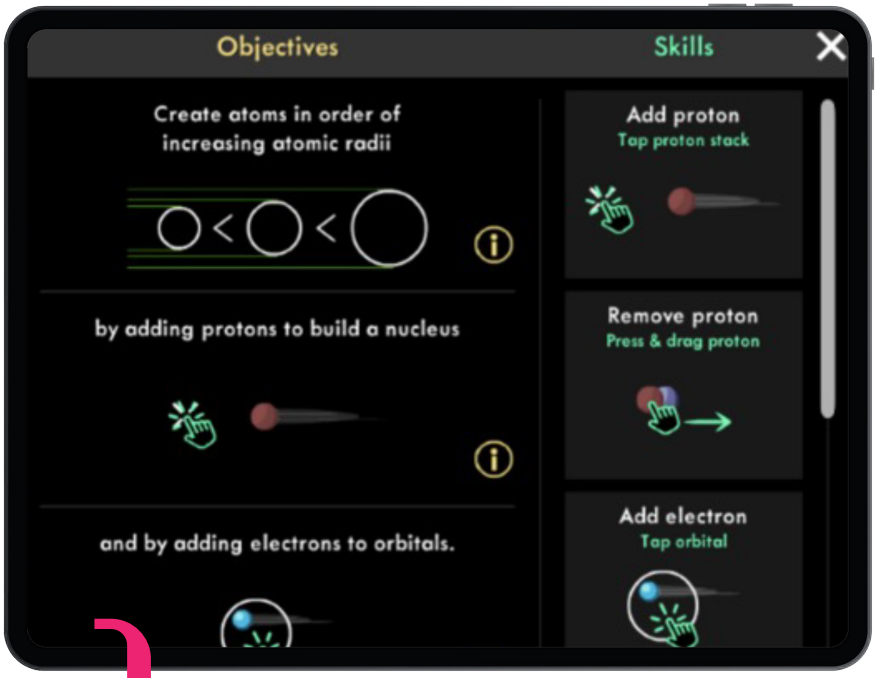
UNUSED PROTONS

UNUSED ELECTRONS

OBJECTIVES & SKILLS

ATOMIC ORBITALS

GAMEPLAY BASICS

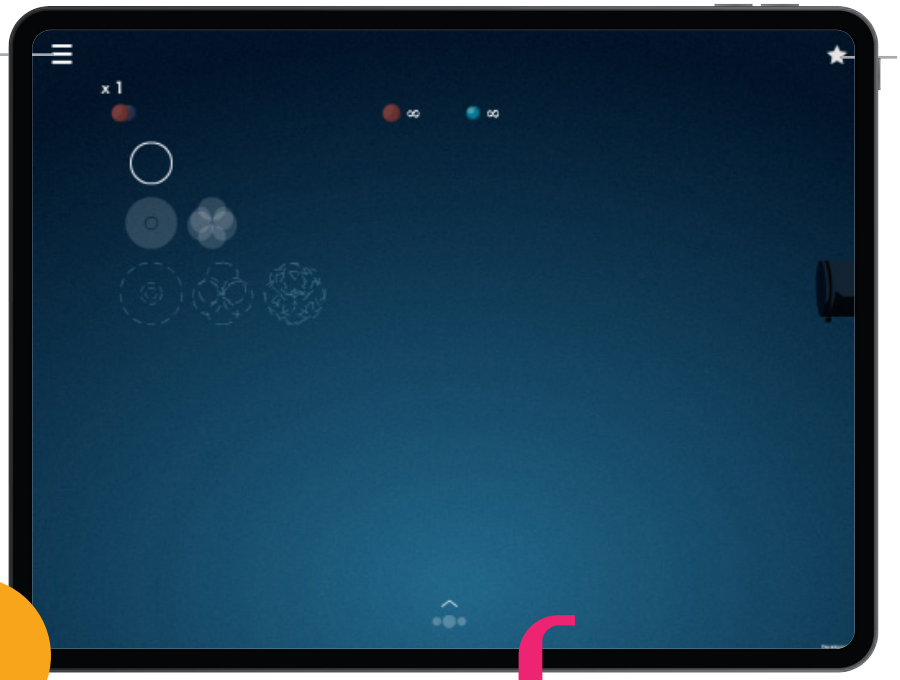


You can use the objectives and skills panel to identify what players should be able to do by the end of each level.

OVERVIEW

MENU + HELP

ACHIEVEMENTS



Radii Trends Sandbox

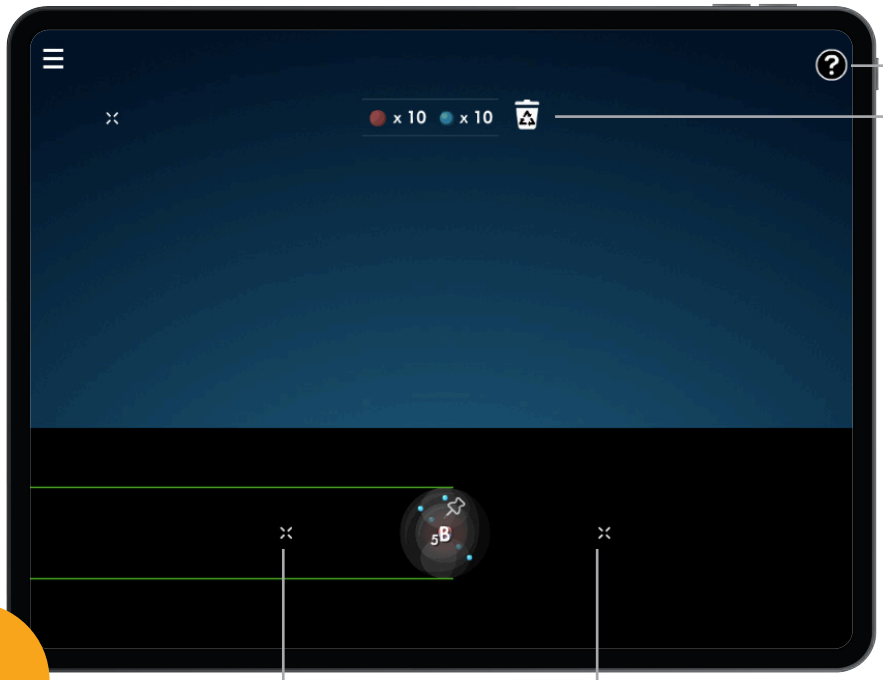
To start, player must add a proton to the anchor.

Player can then begin adding electrons to the orbitals.

- Atom with 2 protons
- Atom with 10 protons
- Atom with 18 protons
- Atom with 36 protons
- 2 < ? < 10 Increasing radii
- 10 < ? < 18 Increasing radii
- 18 < ? < 36 Increasing radii
- Atom with low electronegativity
- Atom with med electronegativity
- Atom with high electronegativity
- Atom with 4 valence electrons
- 6 valence & high electronegativity

Sandbox Achievements

OVERVIEW

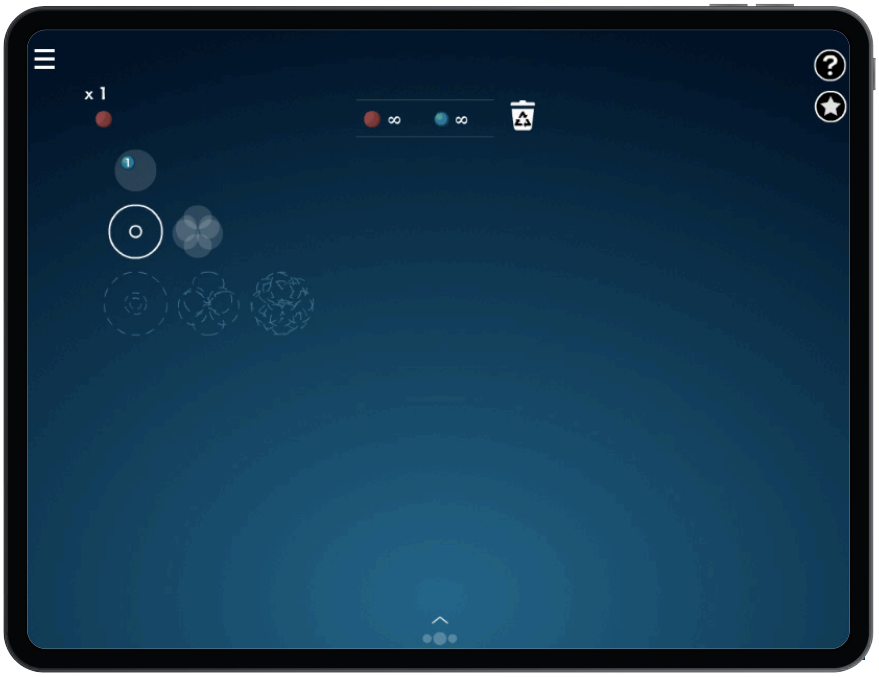


Radii Trends Challenges

GOAL: Use the existing atom(s) as guides to complete a series of atoms increasing in physical size from left to right. All protons & electrons must be used in the final solution.

CHEMISTRY CONNECTIONS

PLAYER CAN PLACE PROTONS (●) ON THE ANCHOR AND ELECTRONS (●) IN THE ORBITALS.

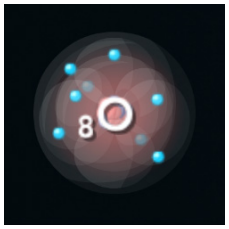


CHEMISTRY CONCEPT:
Electrons are found in orbitals around the nucleus of the atom and protons are found in the center (nucleus) of the atom.

CHEMISTRY CONCEPT:
In a neutral atom, the number of protons equals the number of electrons.

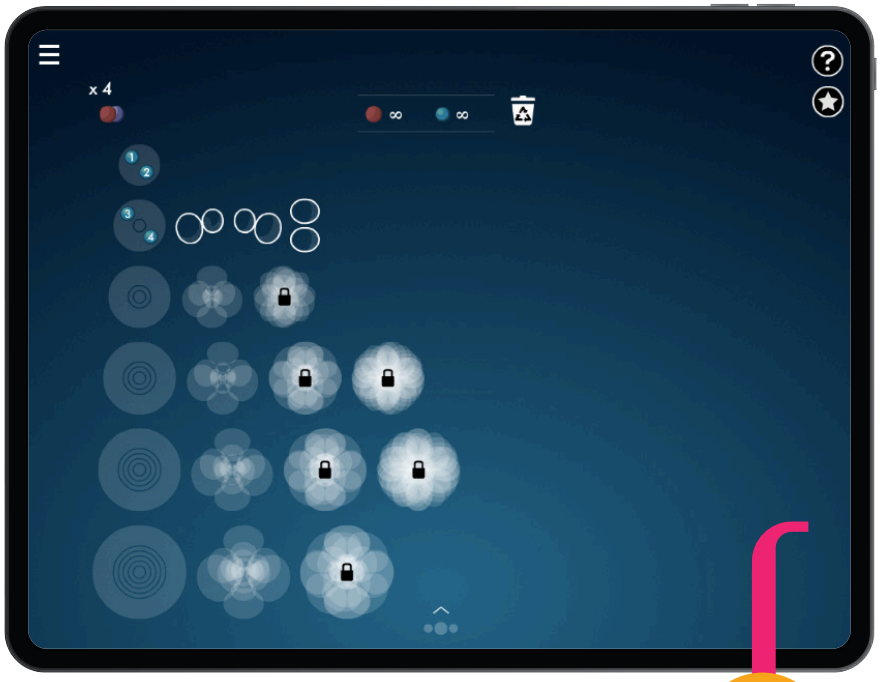
Player must match the number of protons with the number of electrons to complete an atom.

ORBITAL FILL MODE



COMPLETE MODE

CHEMISTRY CONNECTIONS



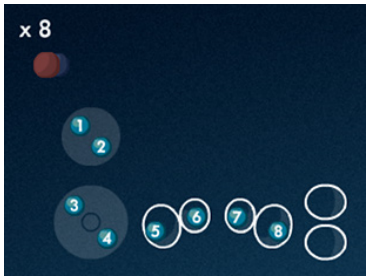
PLAYER MUST FILL EVERY ORBITAL IN A SUBSHELL WITH ONE ELECTRON BEFORE ADDING A SECOND.

CHEMISTRY CONCEPT:
Aufbau Principle

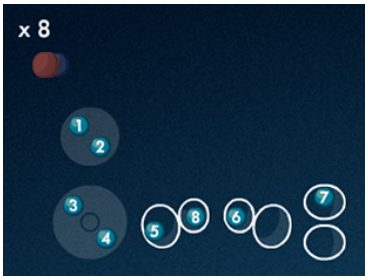
Player must fill orbitals from lowest to highest energy levels.

CHEMISTRY CONCEPT:
Hund's Rule

Player must fill every orbital in a subshell with one electron before adding two.

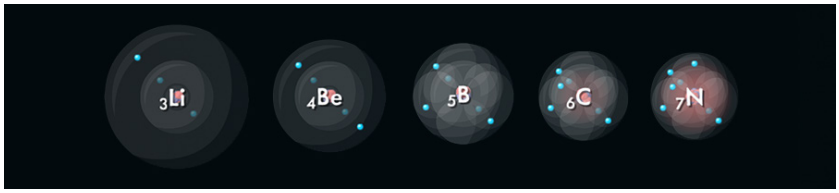


INCORRECT ELECTRON FILLING ORDER

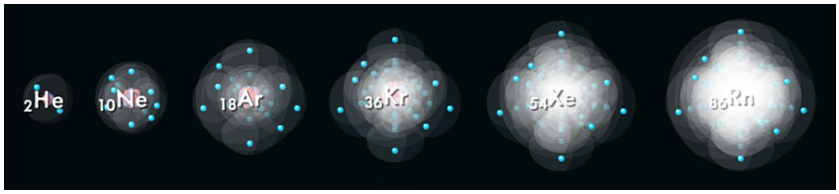


CORRECT ELECTRON FILLING ORDER

CHEMISTRY CONNECTIONS



ATOMIC RADII DECREASES ACROSS A PERIODIC ROW.



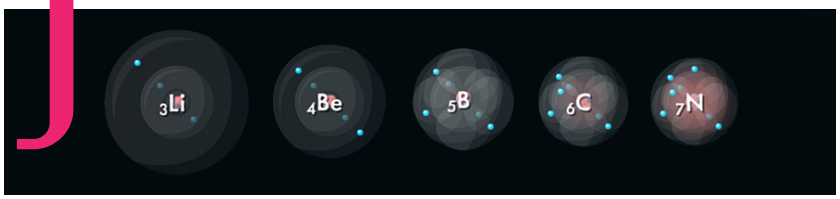
ATOMIC RADII INCREASES DOWN A PERIODIC COLUMN.

CHEMISTRY CONCEPT:
Periodic Trend - Atomic Radius

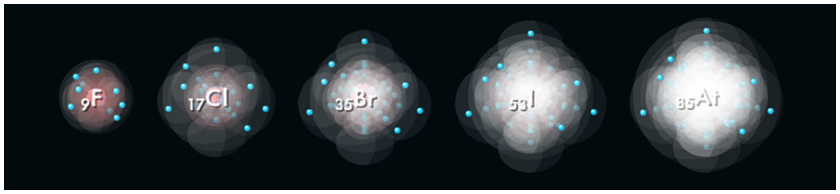
Player can observe the periodic trend of atomic size.

CHEMISTRY CONCEPT:
Electronegativity - Electronegativity is represented by the intensity of the red glow in the center of the atom.

Player can observe the periodic trend of electronegativity.



ELECTRONEGATIVITY INCREASES ACROSS A PERIODIC ROW.



ELECTRONEGATIVITY DECREASES DOWN A PERIODIC COLUMN.

IN-GAME FEEDBACK

Sandbox Check

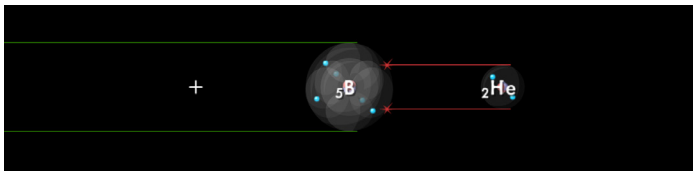
ORBITAL FILL MODE CHECK

- Player can place a maximum of 2 electrons in an orbital. Orbital will flash red if player attempts to add additional electrons.
- Player can check correct electron fill sequence by closing the orbital. If fill order is incorrect, electrons will fall out.
- Player can check that proton # = electron # by swiping up. If proton # ≠ electron #, the atom will not close.

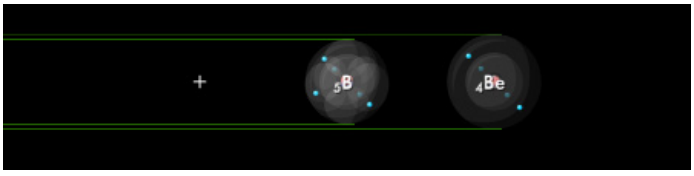
Challenge Level Check

ATOMIC RADII CHECK

To check work in a Challenge level, players can drag a created atom to an anchor. The atomic radius will be compared to other atoms, as shown below.



INCORRECT



CORRECT