

A graphic showing two grey spheres colliding, with a black horizontal line passing through the point of impact and several black spikes radiating outwards.

collisions®

Atoms Game Guide

Atoms Snapshot

Challenges

The Challenge Levels increase in rigor and complexity.

- 13 Challenge Levels*

*The first 5 levels are Tutorial levels.

Sandbox*

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

- 12 Achievements

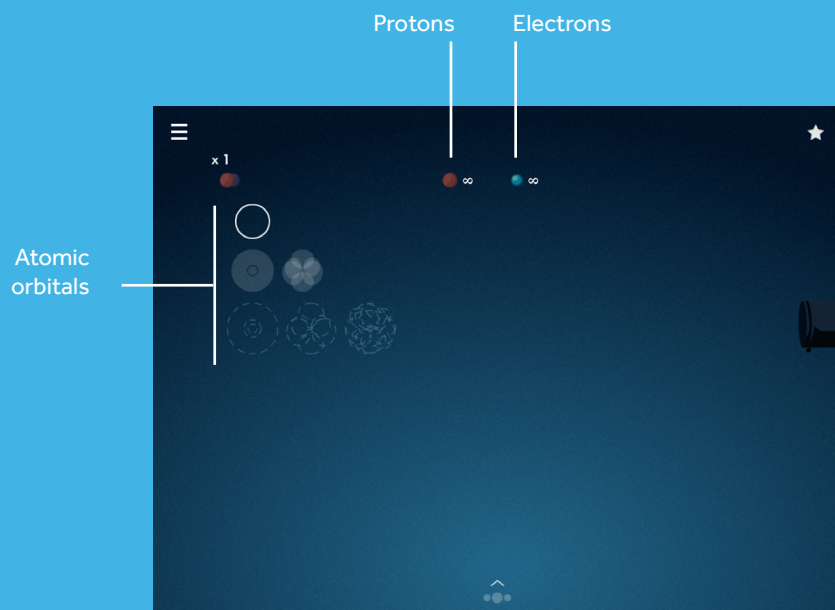
* Players must complete Challenge Levels 1 - 5 (Tutorial Levels) before unlocking the Sandbox.

Integrated Chemistry Concepts

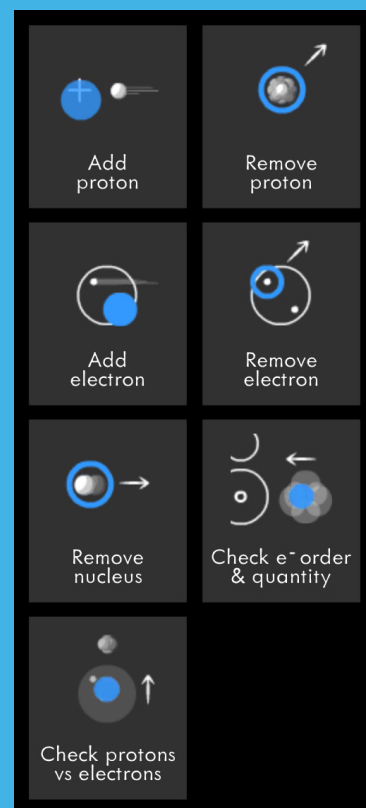
- Proton # = electron #
- Electron configuration
- Aufbau Principle
- Hund's Rule
- Periodic trends:
atomic size, electronegativity

General Information

'Orbital Fill Mode' atom

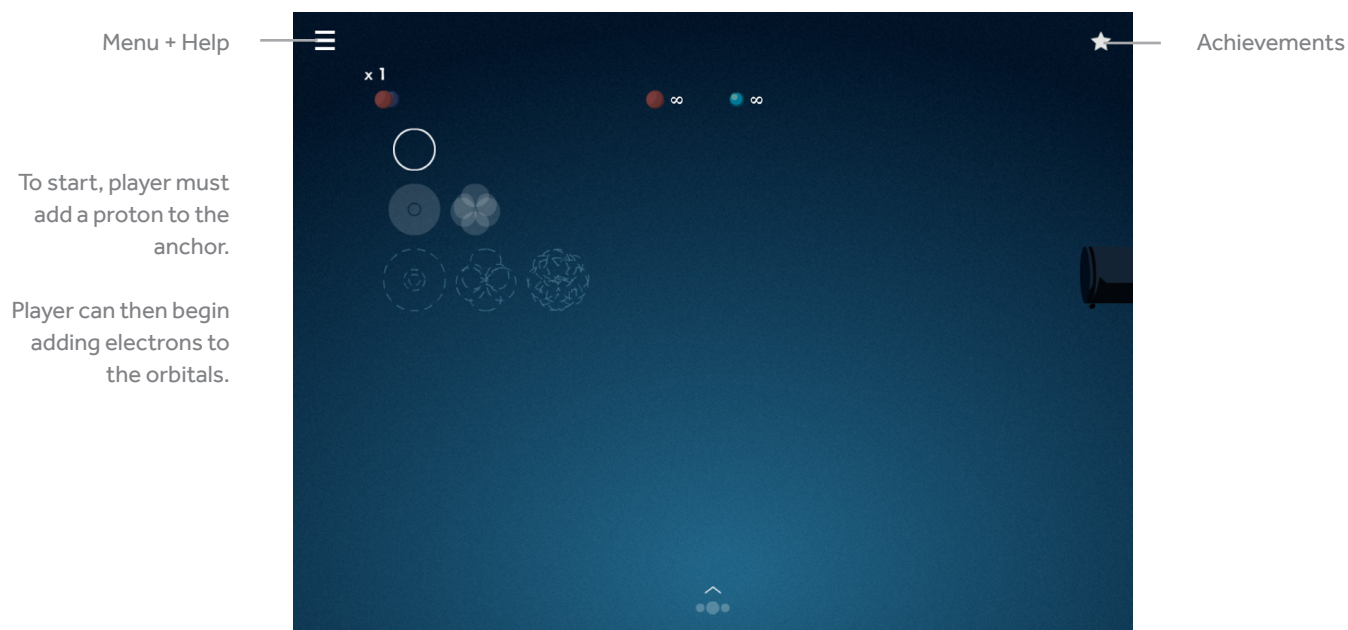


Skills

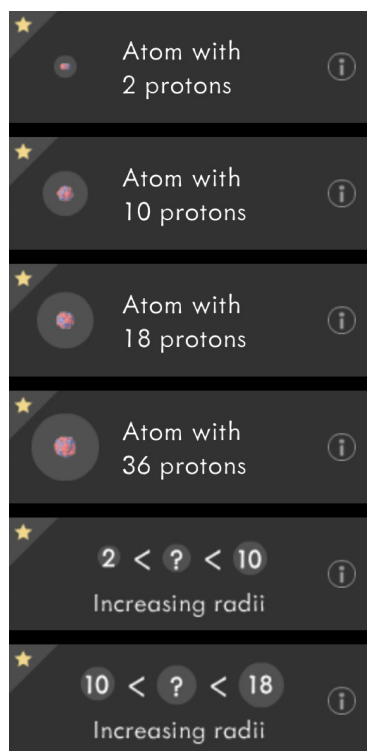


Atoms: Overview

Atoms Sandbox



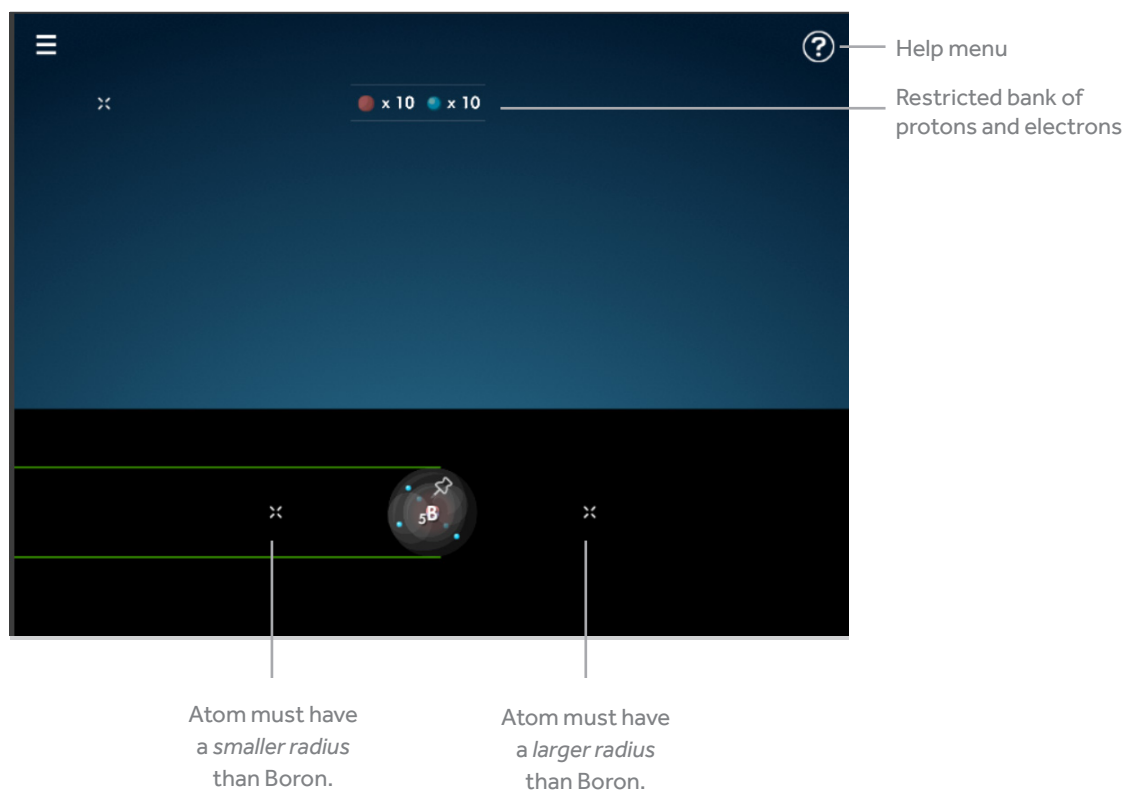
Sandbox Achievements



Atoms: Overview (cont.)

Atoms 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.

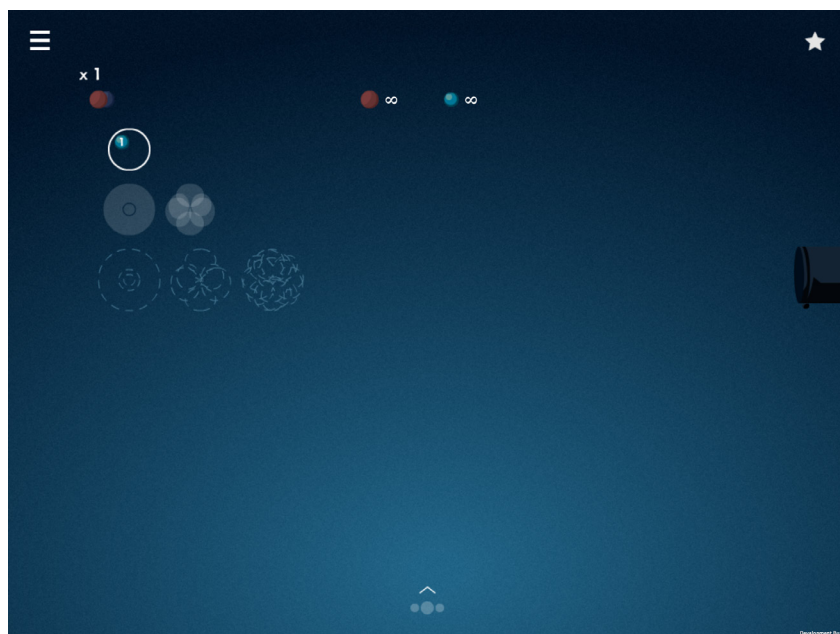


Atoms: Chemistry Connections

CHEMISTRY CONCEPT:

Electrons are found in orbitals around the nucleus of the atom and protons are found in the center (nucleus) of the atom

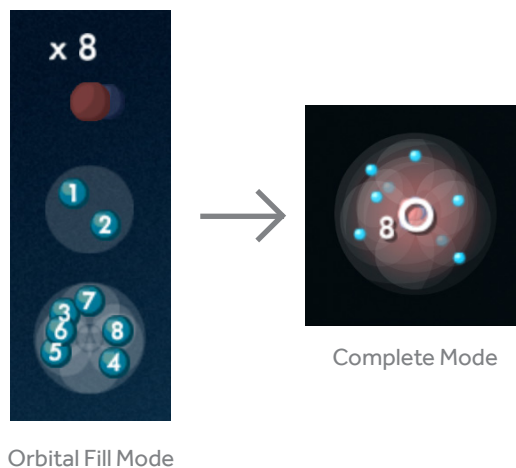
Player can place protons (●) on the anchor and electrons (●) in the orbitals.



CHEMISTRY CONCEPT:

In a neutral atom, the # of protons = the # of electrons.

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



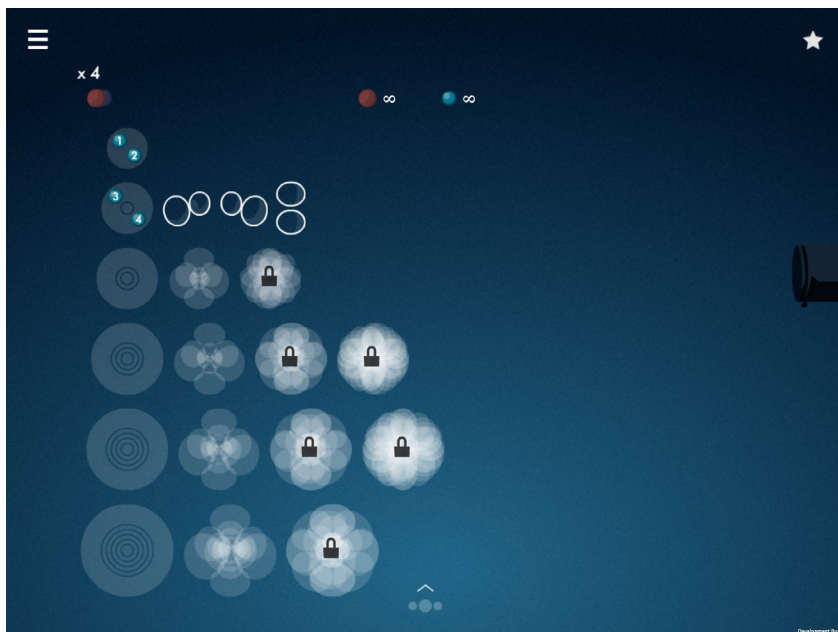
Atoms: Chemistry Connections (cont.)

CHEMISTRY CONCEPT:

Aufbau Principle

Player must fill orbitals from lowest to highest energy levels.

1s
2s, 2p
3s, 3p, 3d
4s, 4p, 4d, 4f
5s, 5p, 5d, 5f
6s, 6p, 6d

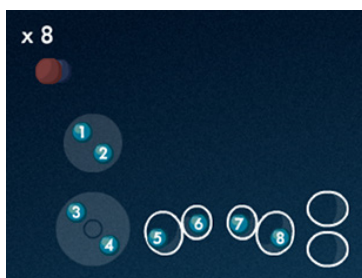


Player must fill every orbital in a sub shell with one electron before adding a second.

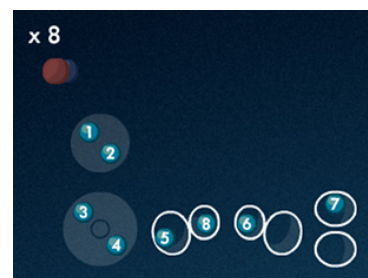
CHEMISTRY CONCEPT:

Hund's Rule

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



Incorrect Electron Filling Order



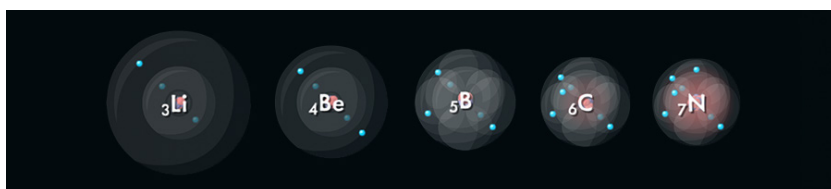
Correct Electron Filling Order

Atoms: Chemistry Connections (cont.)

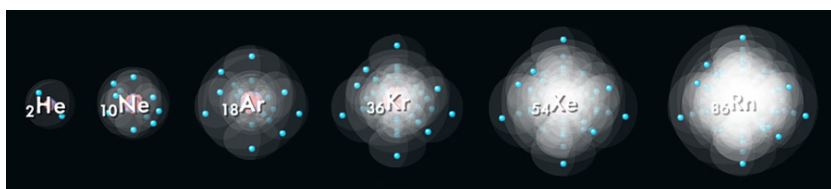
CHEMISTRY CONCEPT:

Periodic Trend: Atomic Size

Player can observe the periodic trend of atomic size.



Atomic radii decreases across a periodic row.



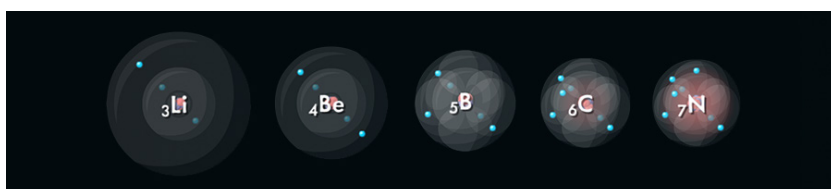
Atomic radii increases down a periodic column.

CHEMISTRY CONCEPT:

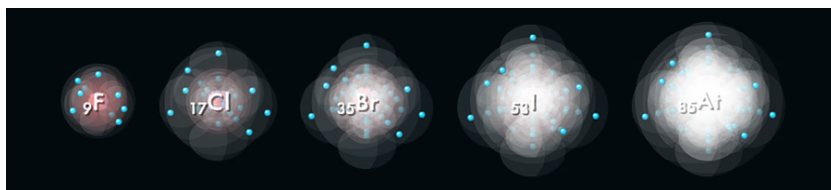
Periodic Trend: Electronegativity

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 row.

Atoms: In-Game Feedback

Sandbox Check

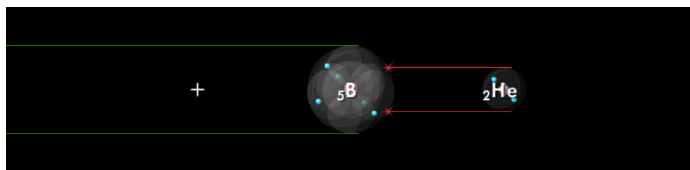
ORBITAL FILL MODE CHECK

- 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 # \neq 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