



collisions®

Ionic Bonding Game Guide

Ionic Bonding Snapshot

Challenges

The Challenge Levels increase in rigor and complexity.

The first 4 levels are tutorial levels.

- 10 core levels
- 3 connected levels to Ions
- 3 connected levels to Acids & Bases

Sandbox*

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

- 10 Achievements

* Players must complete Challenge Levels 1-4 before unlocking the Sandbox.

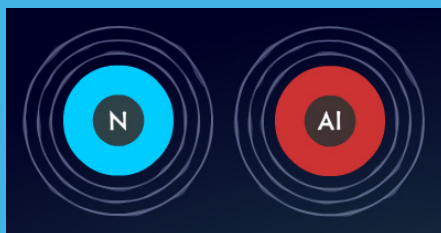
Integrated Chemistry Concepts

- Cations and anions attract
- Ionic compounds contain 1 type of cation and 1 type of anion
- Ionic compounds have an overall neutral charge
- Ionic compounds are found in common ratios

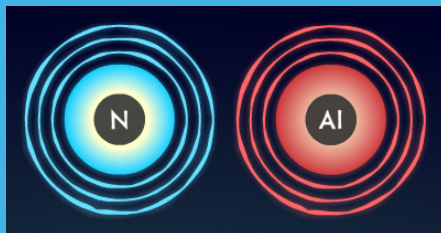
General Information

'Bond mode' ion

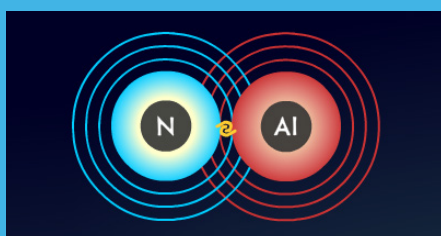
Inactive ions



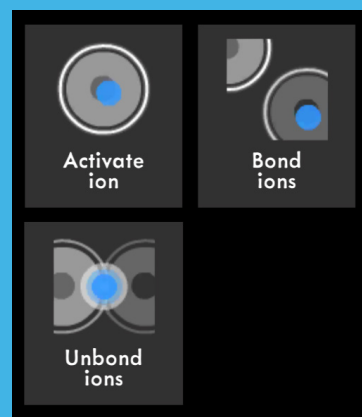
Active ions



Bonded ions

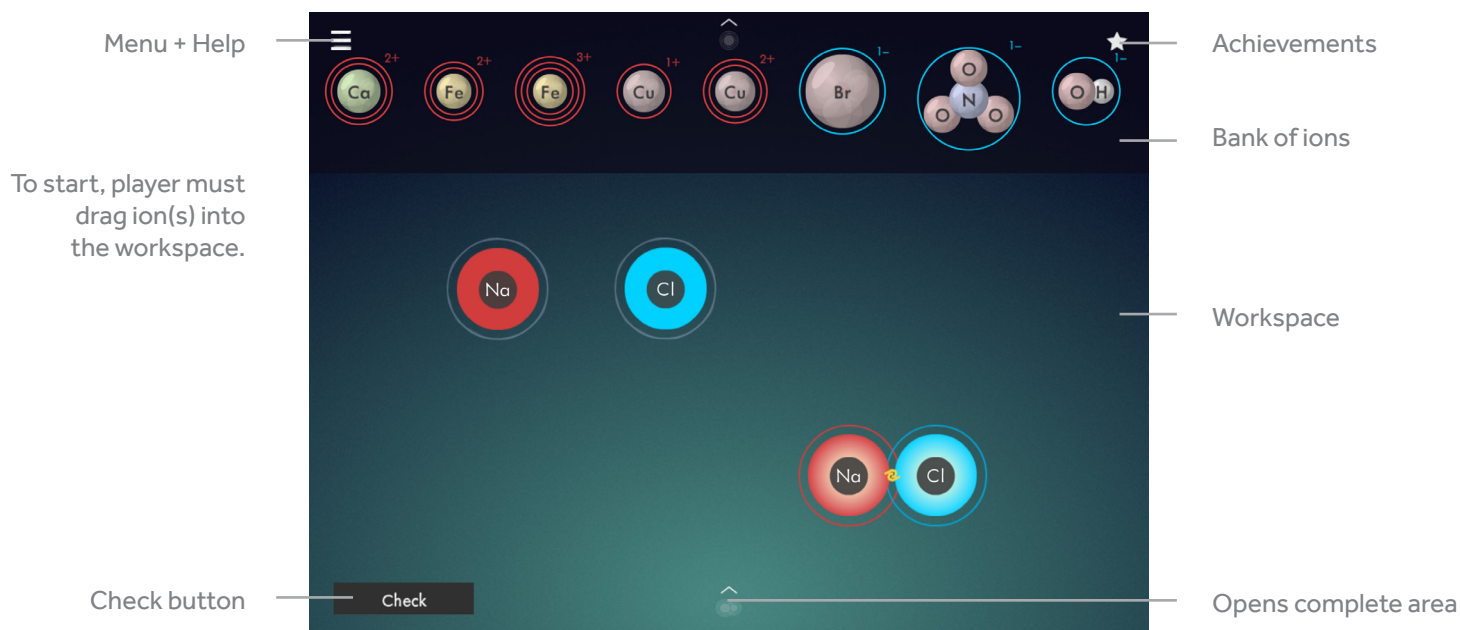


Skills

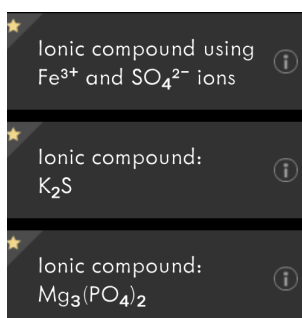
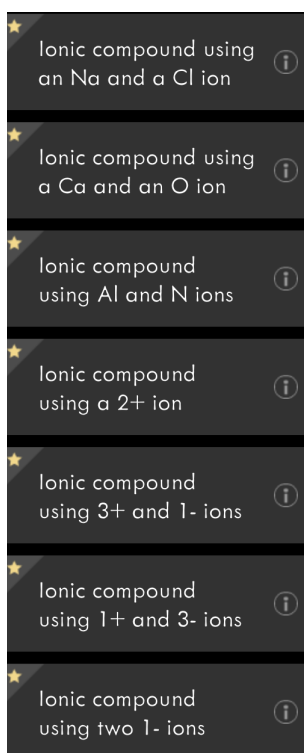


Ionic Bonding: Overview

Ionic Bonding Sandbox



Achievements



Selected Bank of Ions

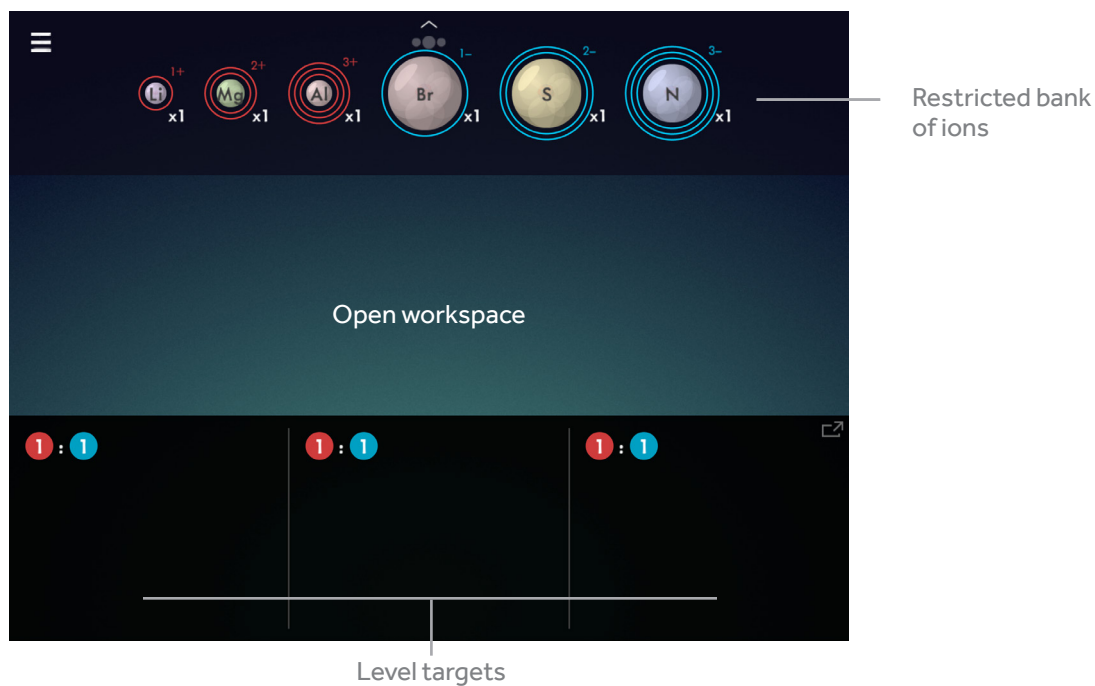
The bank includes the following ions:

Li^{+}	Fe^{2+}
N^{3-}	Fe^{3+}
O^{2-}	Cu^{+}
F^{-}	Cu^{2+}
Na^{+}	Br^{-}
Mg^{2+}	NO_3^{-}
Al^{3+}	OH^{-}
S^{2-}	PO_4^{3-}
Cl^{-}	SO_4^{2-}
K^{+}	CO_3^{2-}

Ionic Bonding: Overview (cont.)

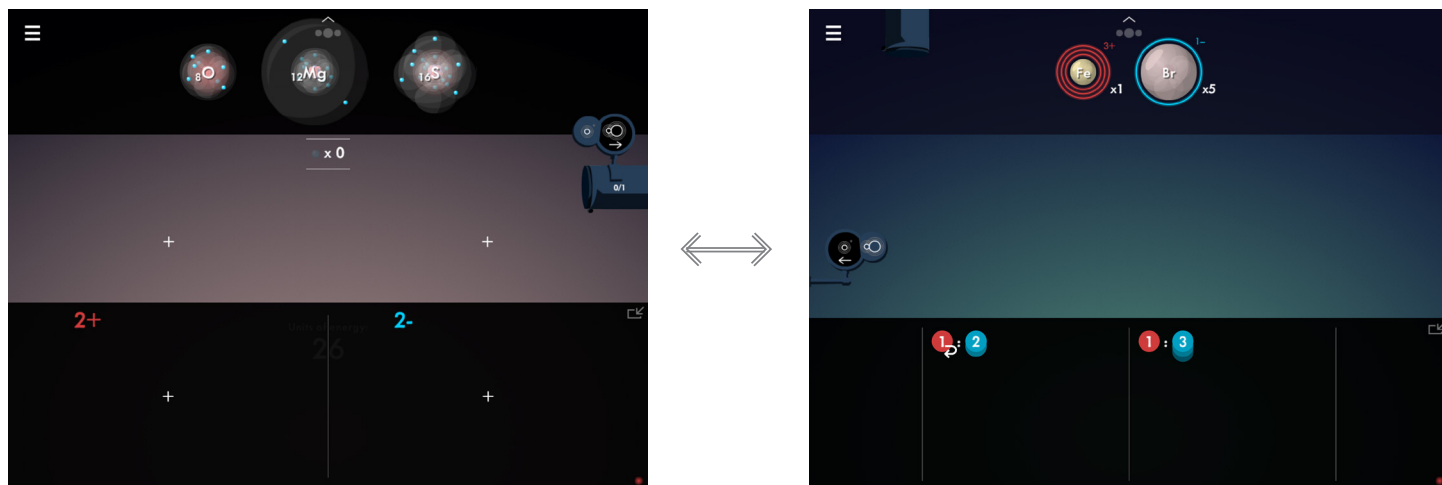
Ionic Bonding Challenges

LEVELS 1-8 GOAL: Using the ions in the bank, build ionic compounds that satisfy the ratios in the targets.

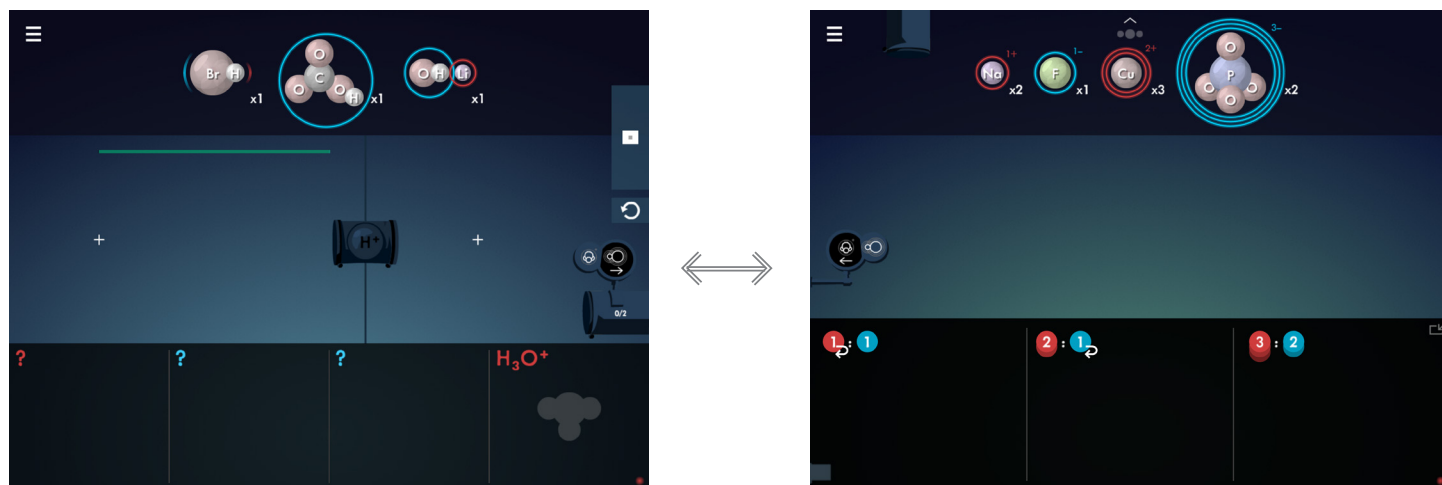


Ionic Bonding: Overview (cont.)

IONS to IONIC BONDING CONNECTED LEVELS GOAL: Some ions are missing from the bank. Use the button on the left to go to Ions. Solve the challenge to bring back the missing ions!

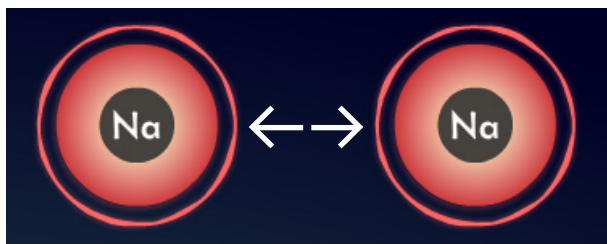


ACIDS & BASES to IONIC BONDING CONNECTED LEVELS GOAL: Some ions are missing from the bank. Use the button on the left to go to Acids & Bases. Solve the challenge to bring back the missing ions!



Ionic Bonding: Chemistry Connections

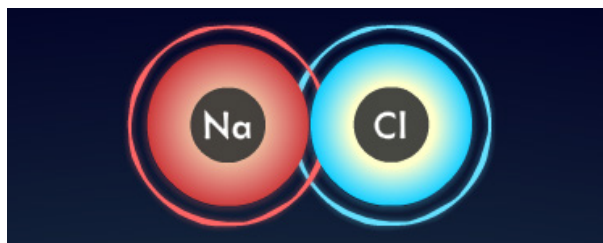
CHEMISTRY CONCEPT: **Similarly charged ions repel and oppositely charged ions attract.**



Positively charged ions *repel* one another.

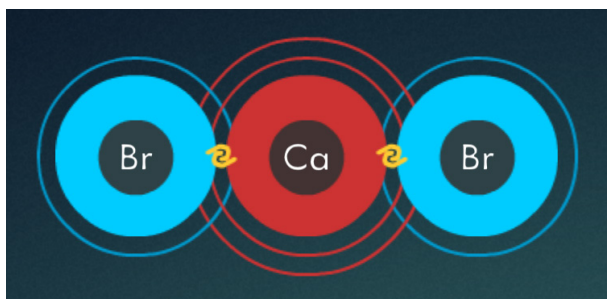


Negatively charged ions *repel* one another

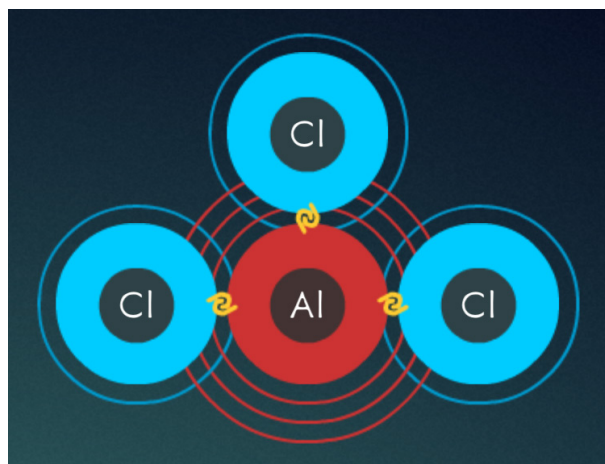


Positively charged ions *attract* to negatively charged ions.

CHEMISTRY CONCEPT: **An ionic compound contains 1 type of cation and 1 type of anion.**



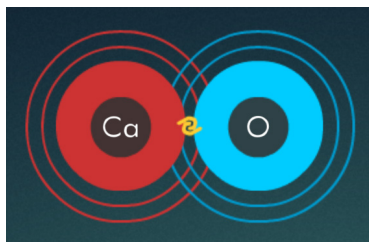
Cation: Ca^{2+}
Anion: Br^-



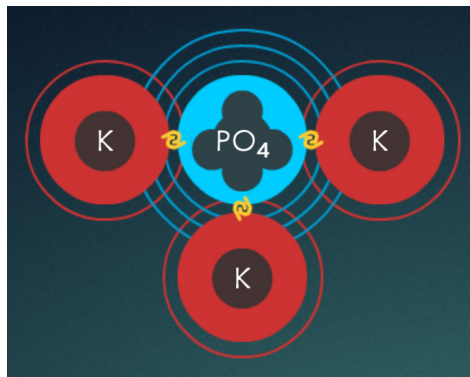
Cation: Al^{3+}
Anion: Cl^-

Ionic Bonding: Chemistry Connections (cont.)

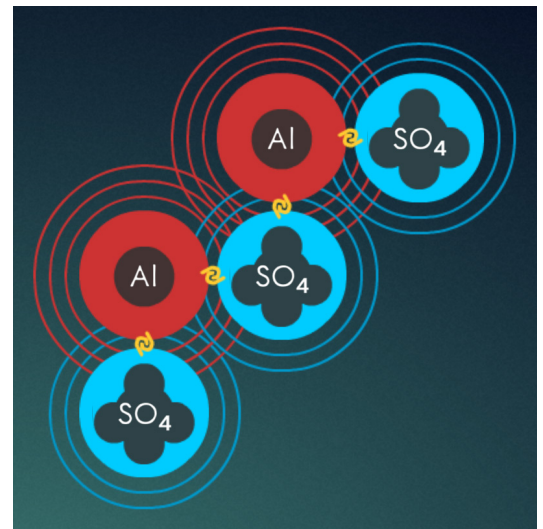
CHEMISTRY CONCEPT: **In an ionic compound, the overall charge is neutral.**



2 = 2

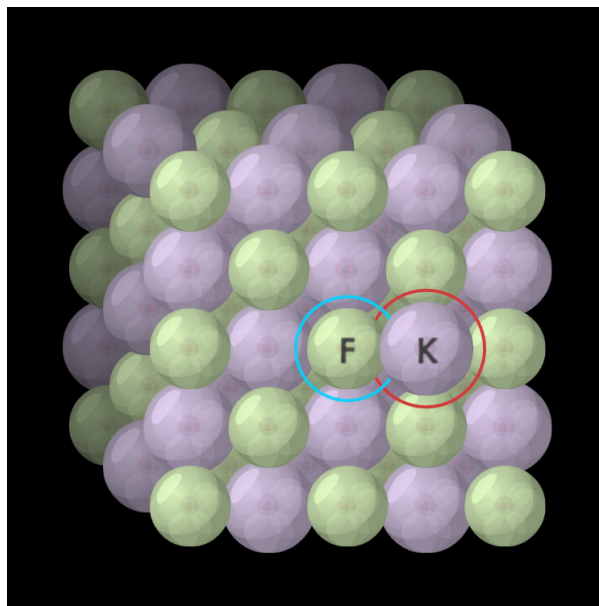


3 = 3



6 = 6

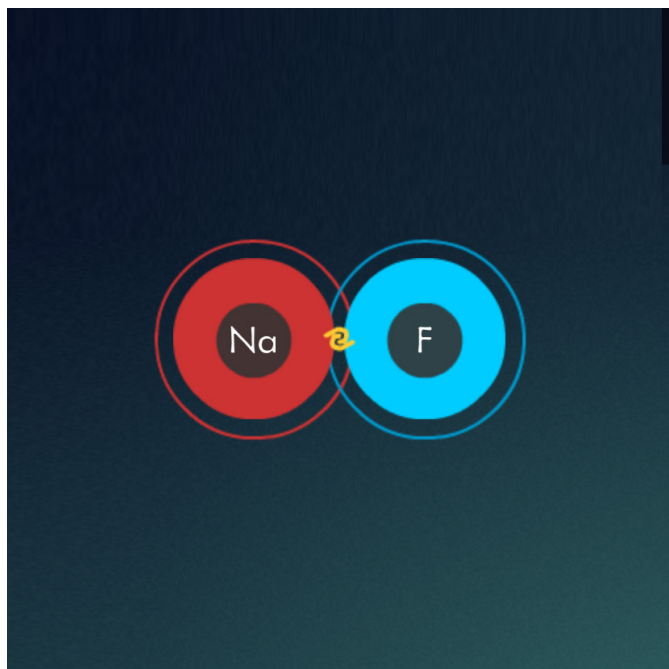
CHEMISTRY CONCEPT: **The individual ions of an ionic compound are arranged in an orderly, closely packed manner.**



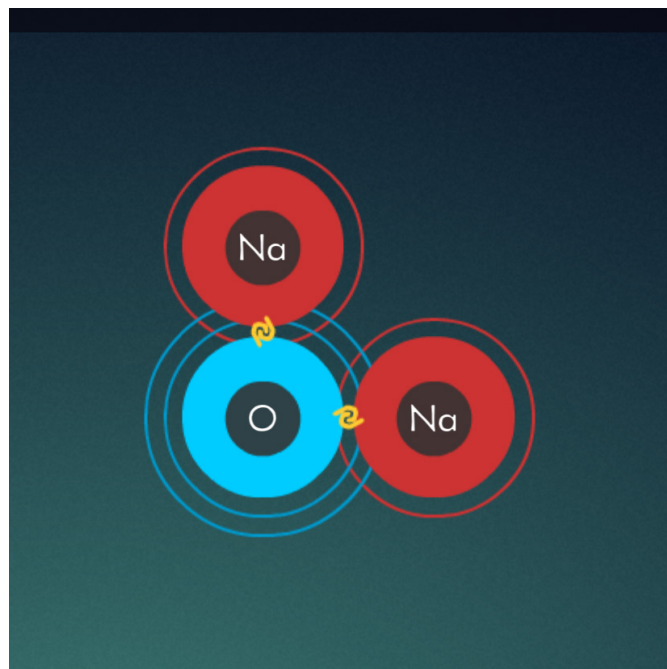
This visual representation appears after each check in the levels.

Ionic Bonding: Chemistry Connections (cont.)

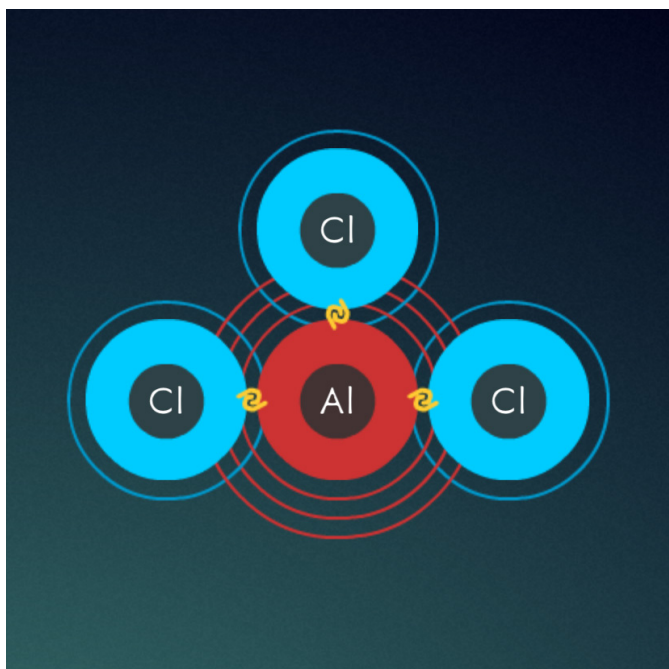
CHEMISTRY CONCEPT: **Ionic compounds are composed of a specific ratio of cations to anions.**



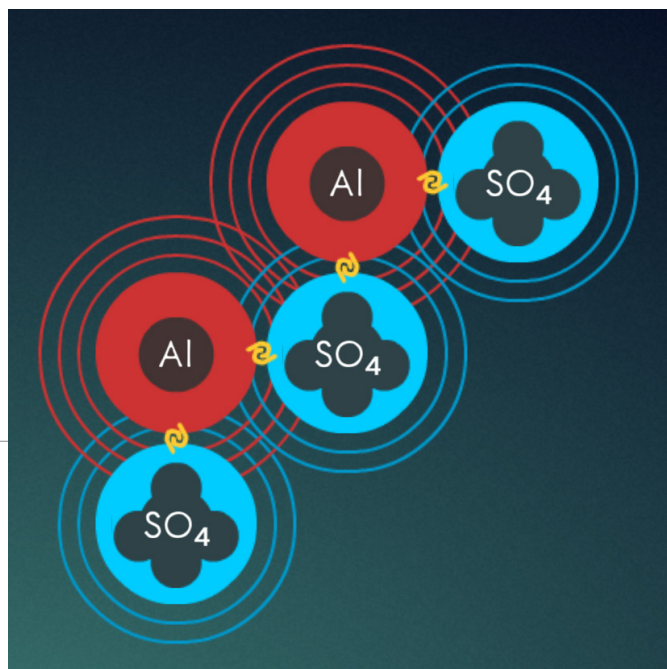
1:1



2:1



1:3

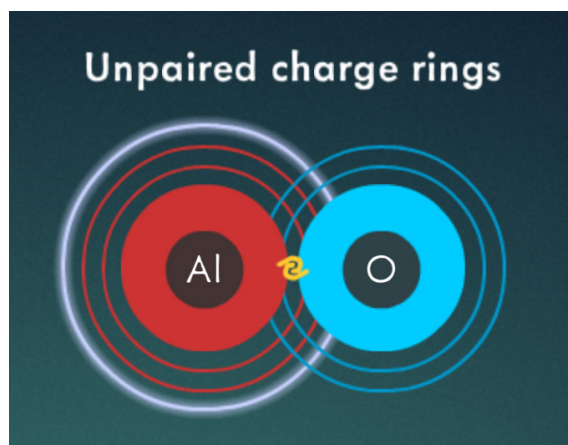


2:3

Ionic Bonding: In-Game Feedback

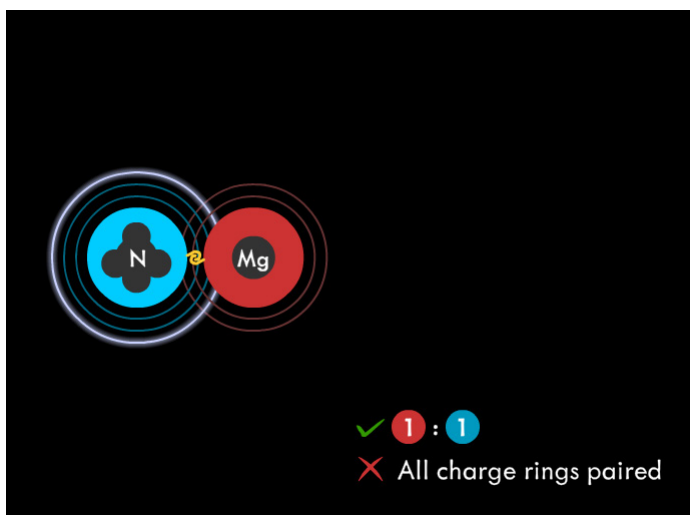
Sandbox Check

Player can use the **Check** button in Sandbox to receive immediate feedback.

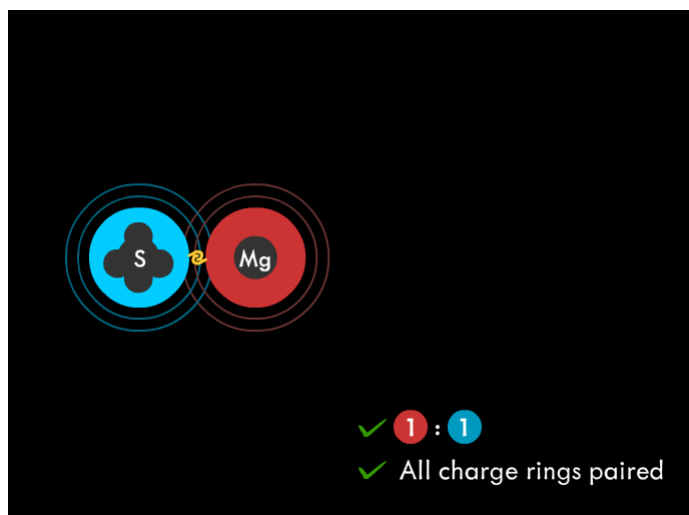


Challenge Level Check

To check work in a Challenge level, players can drag an ionic compound to a chosen target. The ionic compound will be checked against the target based on key chemistry content, as outlined below.



Incorrect



Correct