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Covalent Bonding Game Guide

Covalent Bonding Snapshot

Challenges

The Challenge Levels increase in rigor and complexity.

The first 7 levels are tutorial levels.

- 17 core levels
- 4 connected levels to Atoms

Sandbox*

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

- 14 Achievements

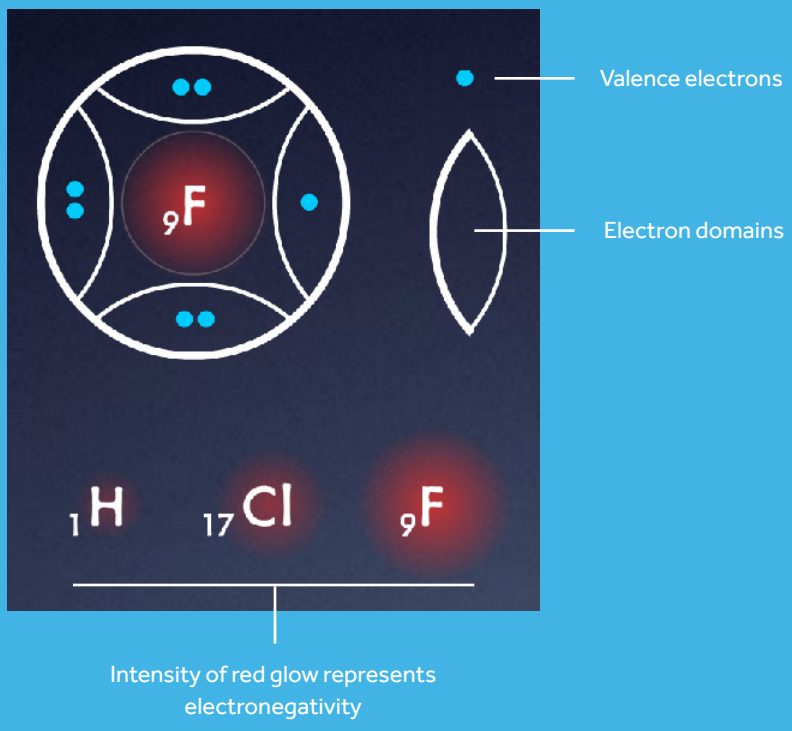
* Players must complete Challenge Levels 1-7 before unlocking the Sandbox.

Integrated Chemistry Concepts

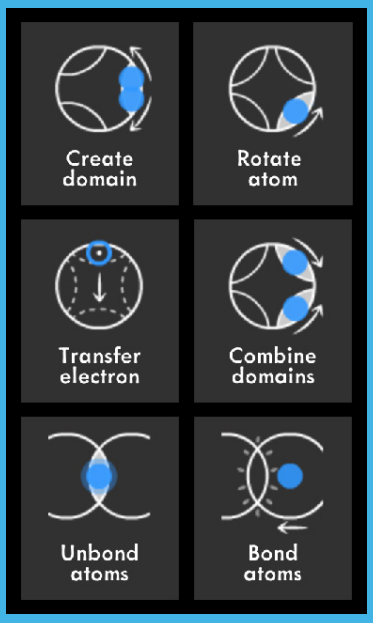
- Octet rule
- Types of bonds
- Bond polarity
- Molecular shape

General Information

'Bond Mode' atom

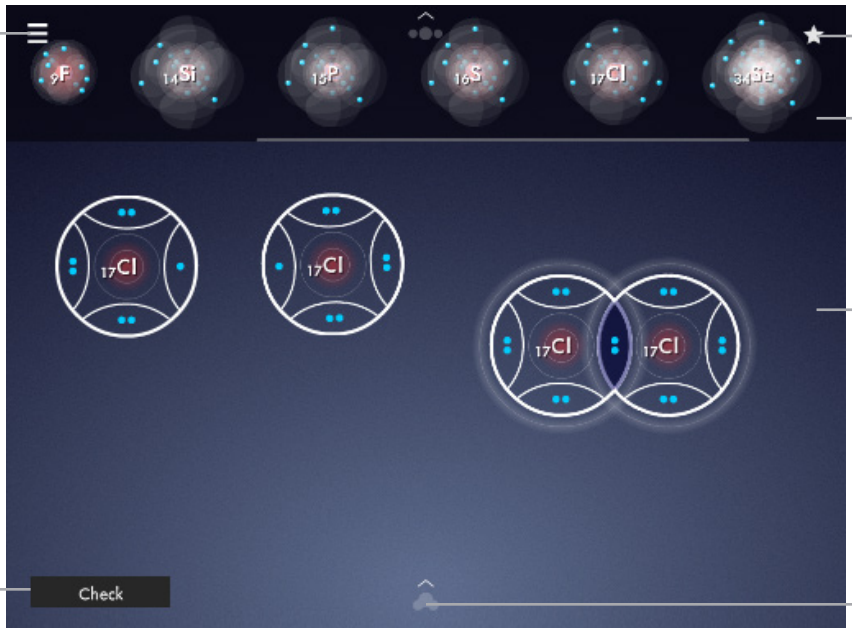


Skills

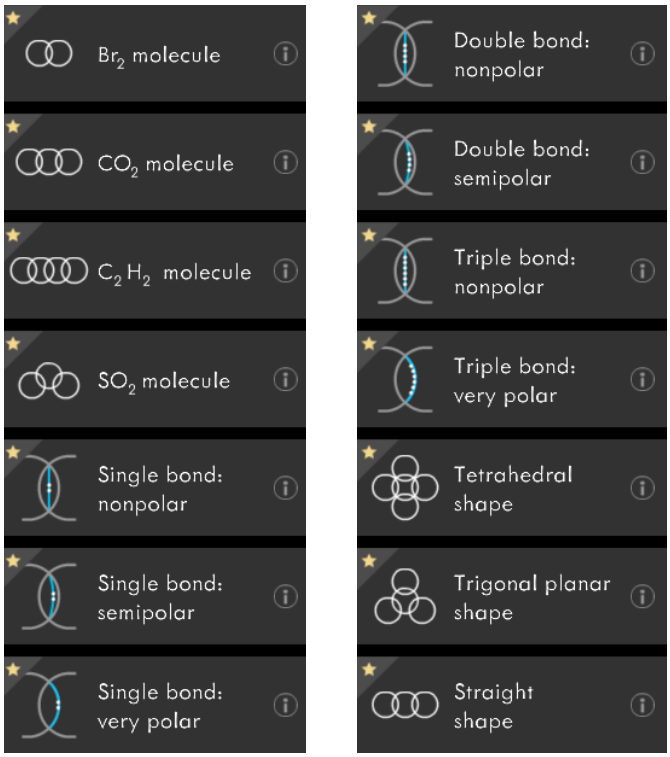


Covalent Bonding: Overview

Covalent Bonding Sandbox



Achievements



Selected Bank of Atoms

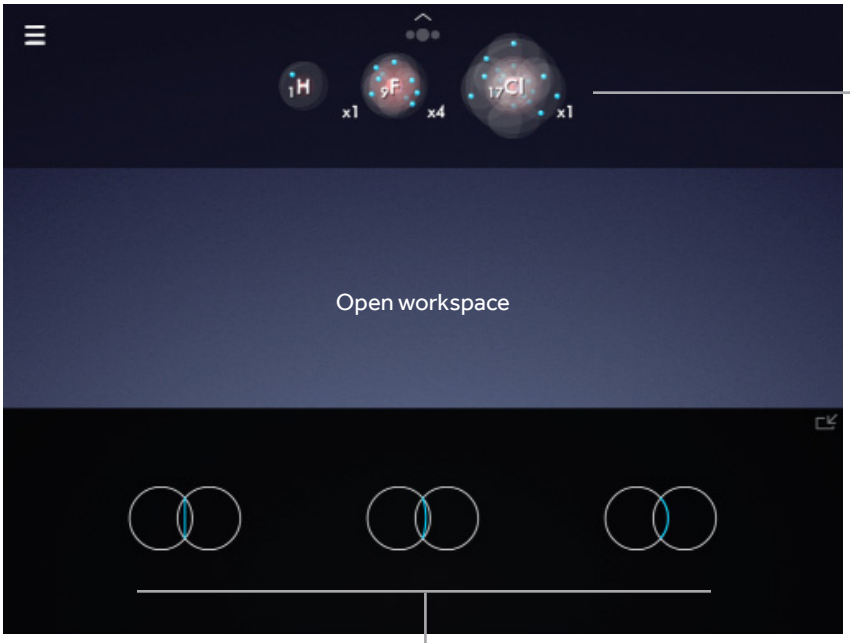
The bank includes the following atoms:

- Hydrogen
- Carbon
- Nitrogen
- Oxygen
- Fluorine
- Silicon
- Phosphorus
- Sulfur
- Chlorine
- Selenium
- Bromine

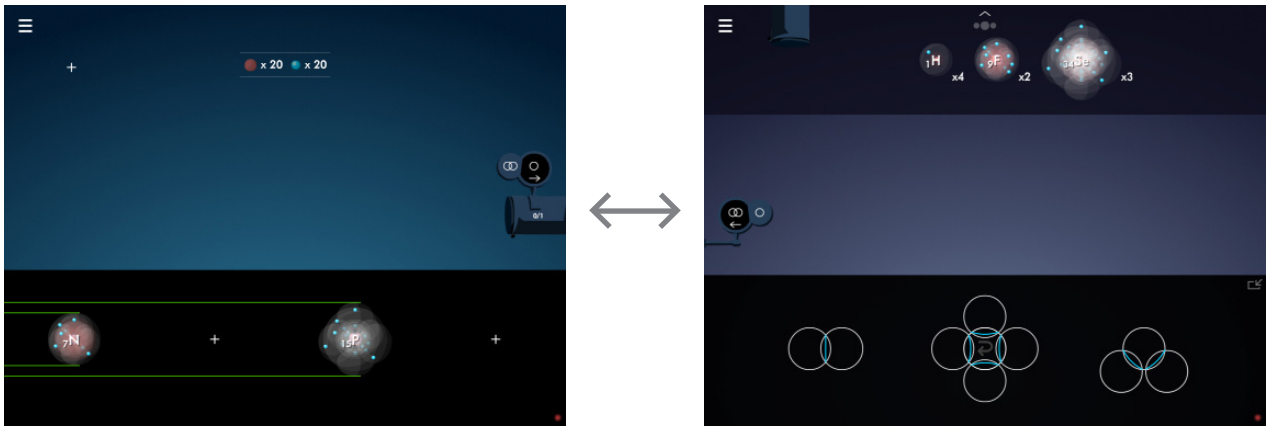
Covalent Bonding: Overview (cont.)

Covalent Bonding Challenges

LEVELS 1 - 11 GOAL: Bond the atoms to complete the shapes and hit the bond polarity targets.



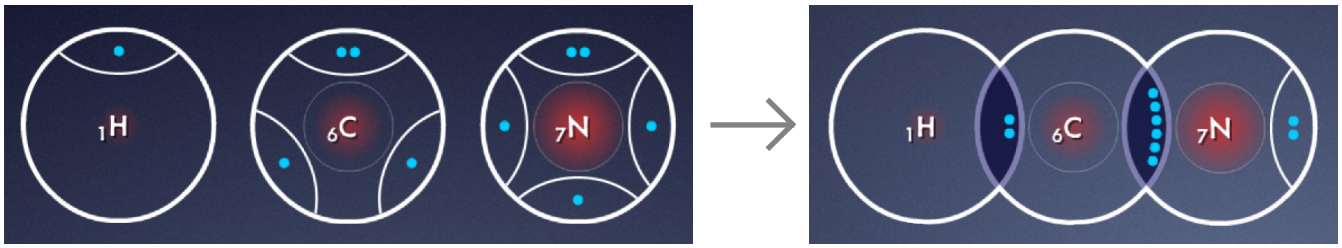
ATOMS to COVALENT BONDING CONNECTED LEVELS GOAL: Some atoms are missing from the bank. Use the button on the left to go to Atoms. Solve the challenge and bring back the missing atoms!



Covalent Bonding: Chemistry Connections

CHEMISTRY CONCEPT: **Octet rule**

Player can combine atoms in such a way that each atom of a molecule has a full set of valence electrons.

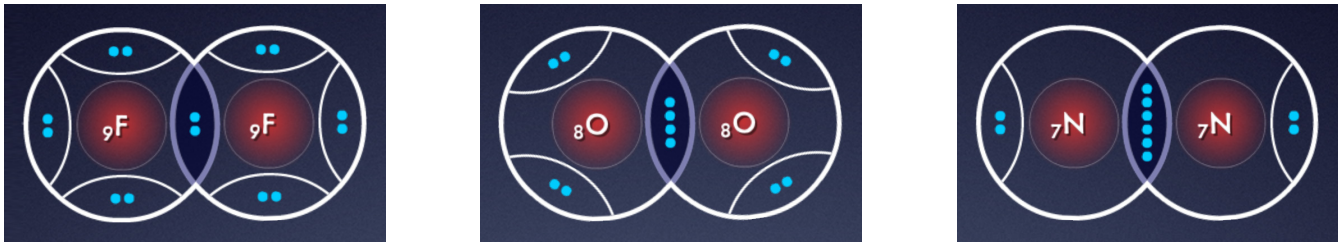


Valence electrons represented

Octet satisfied

CHEMISTRY CONCEPT: **Types of bonds**

Player can create single, double, and triple bonded molecules.



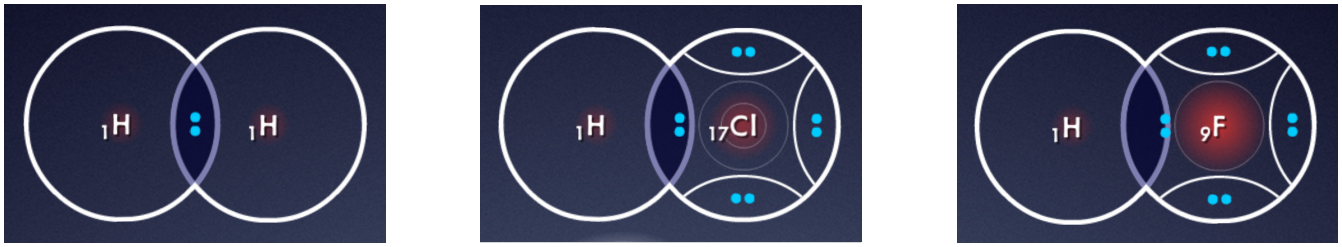
Single bond
2 shared electrons

Double bond
4 shared electrons

Triple bond
6 shared electrons

CHEMISTRY CONCEPT: **Bond polarity**

Player can create non-polar, semi-polar, and very polar bonds by combining atoms of various electronegativities.



Non-polar bond

Semi-polar bond

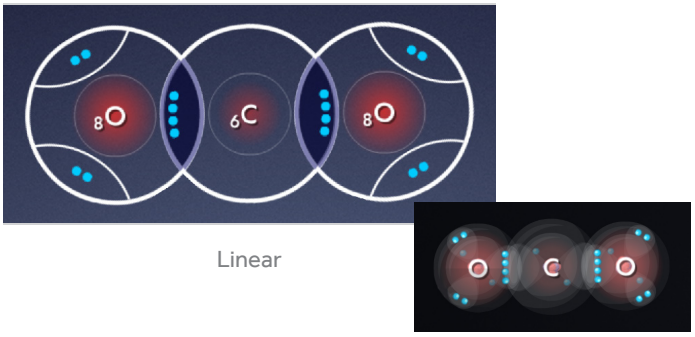
Very-polar bond

Player can observe shared electrons moving closer to the atom with the higher electronegativity.

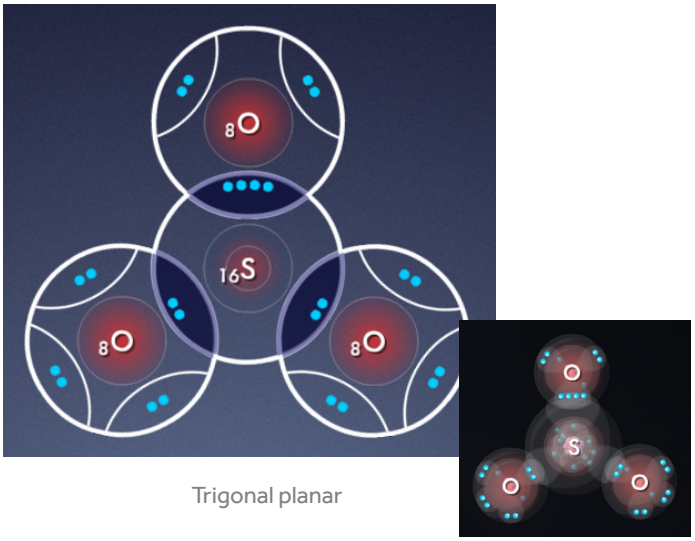
Covalent Bonding: Chemistry Connections (cont.)

CHEMISTRY CONCEPT: **Molecular shape**

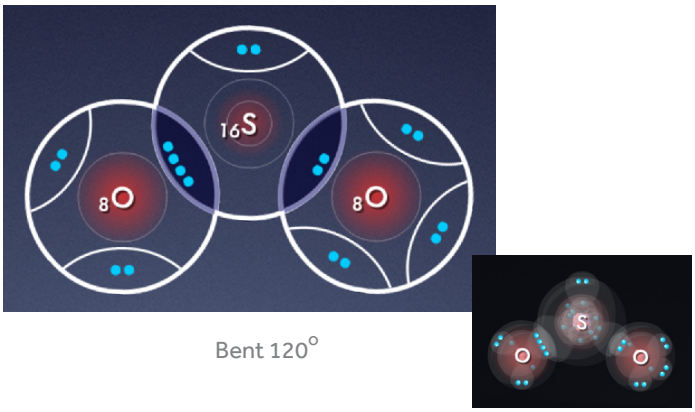
Player can create molecules that have the basic molecular shapes with 4 or fewer electron domains.



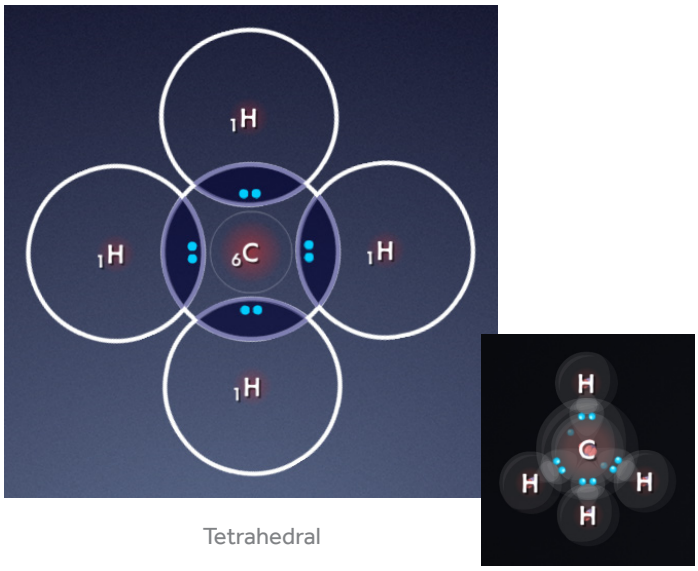
Linear



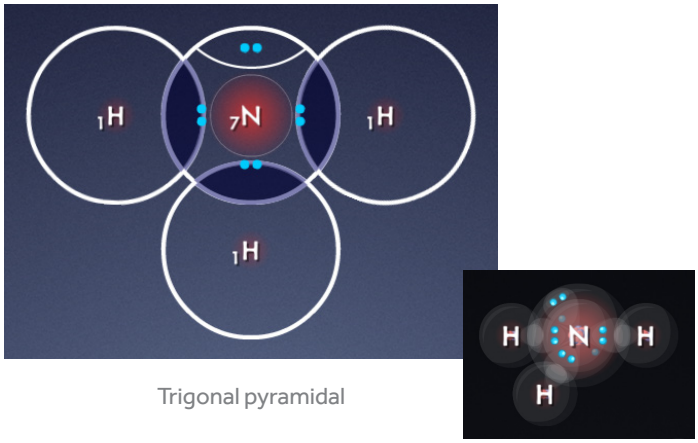
Trigonal planar



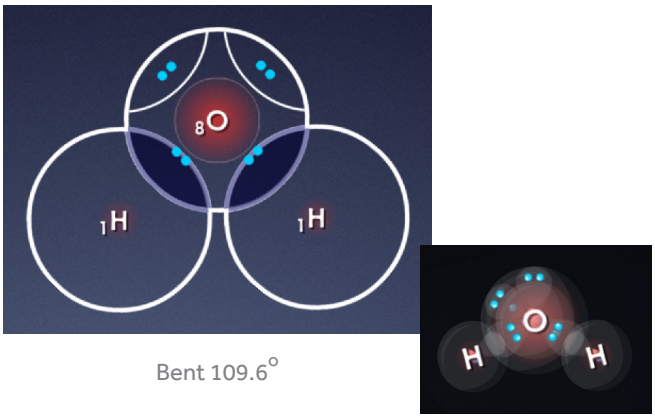
Bent 120°



Tetrahedral



Trigonal pyramidal

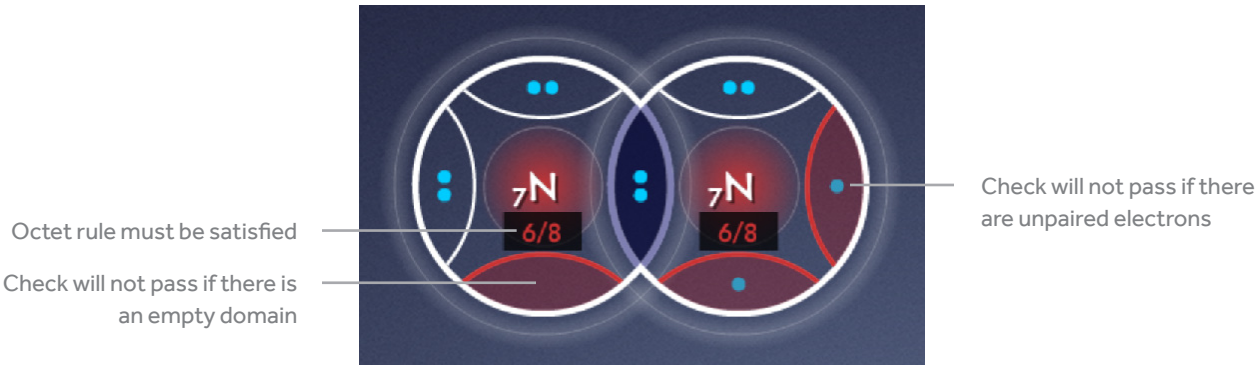


Bent 109.6°

Covalent Bonding: In-Game Feedback

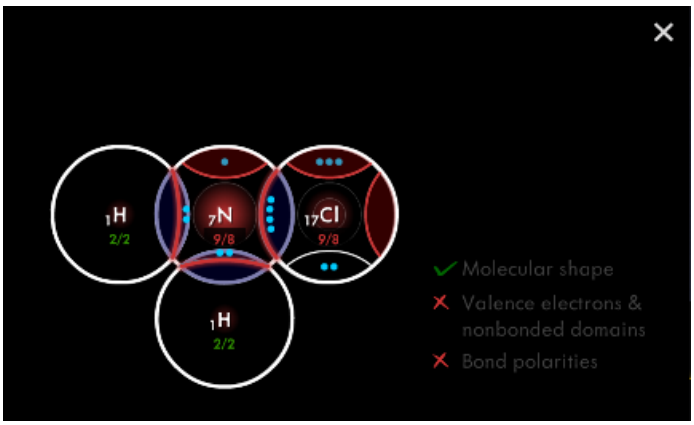
Sandbox Check

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

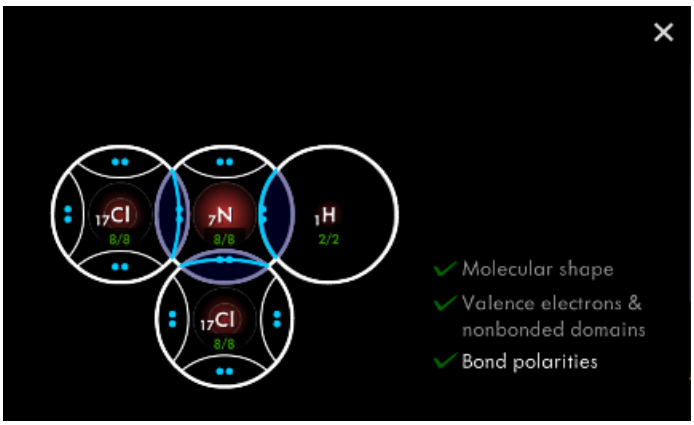


Challenge Level Check

To check work in a Challenge level, players can drag a 'bond mode' molecule to a chosen target. Molecule will be checked against the target based on key chemistry content, as outlined below.



Incorrect



Correct