



collisions®

Intermolecular Forces Game Guide

Intermolecular Forces Snapshot

Challenges

The Challenge Levels increase in rigor and complexity.

The first 6 levels are tutorial levels.

- 17 core levels
- 3 connected levels to Atoms
- 3 connected levels to Covalent Bonding

Sandbox*

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

- 12 Achievements

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

Integrated Chemistry Concepts

- Polar vs. nonpolar molecules
- Types of IMFs:
 - London Dispersion Forces
 - Dipole-Dipole
 - Hydrogen Bond
- Strength of IMFs

General Information

IMF Types



Hydrogen Bond

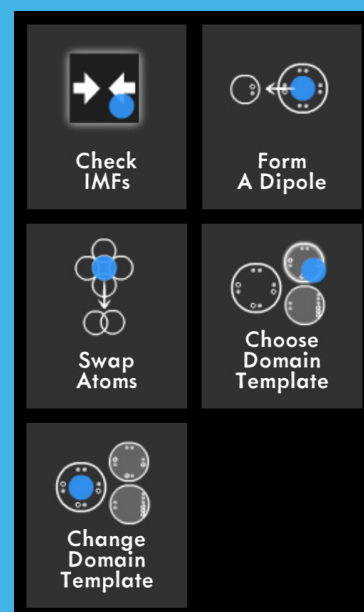


Dipole-Dipole



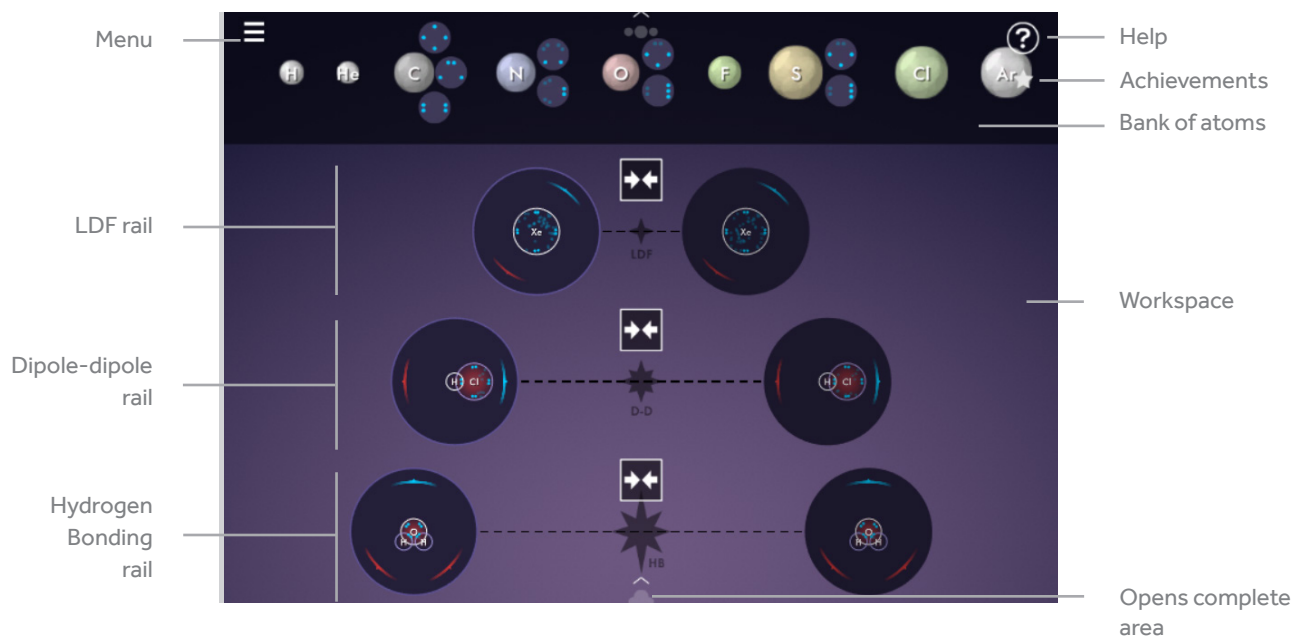
London Dispersion Forces

Skills



Intermolecular Forces: Overview

Intermolecular Forces Sandbox



Achievements

- ★ IMFs Between He
- ★ IMFs Between BrF
- ★ IMFs Between H₂O
- ★ Diatomic Non-Polar
- ★ Diatomic Polar
- ★ Tetrahedral Non-Polar
- ★ Tetrahedral Polar

- ★ London Dispersion Force
- ★ Dipole-Dipole
- ★ Hydrogen Bond
- ★ Weaker IMFs than HF
- ★ Weaker IMFs than CH₄

Selected Bank of Atoms

- | | |
|----|----|
| H | F |
| He | Cl |
| C | Ar |
| N | Br |
| O | Xe |
| S | |

Intermolecular Forces: Overview (cont.)

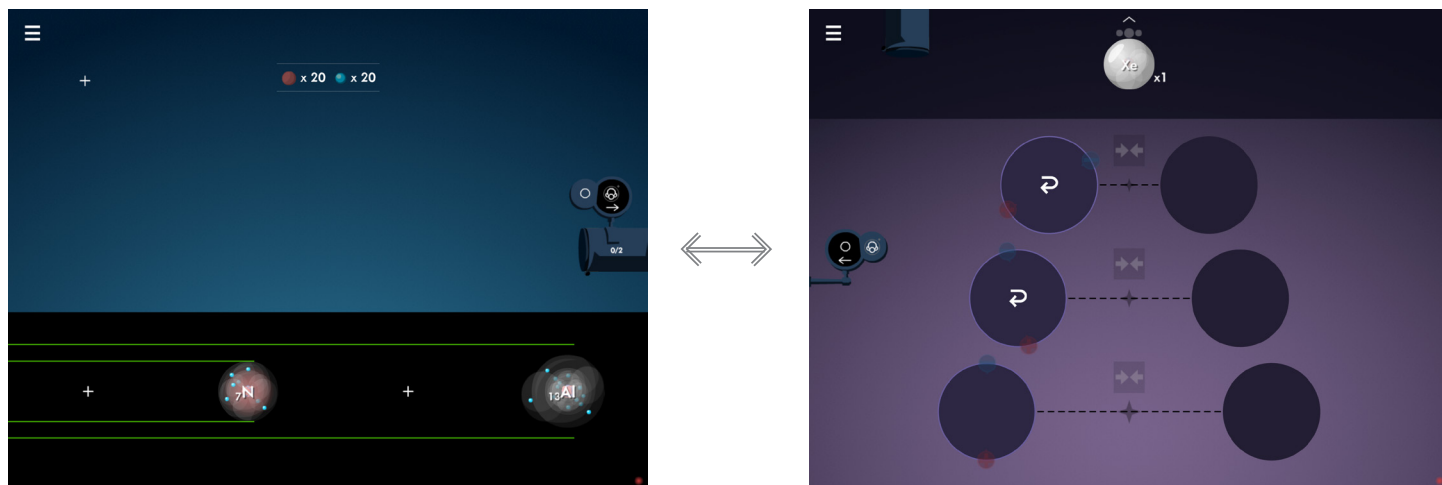
Intermolecular Forces Challenges

LEVELS 1-17 GOAL : Build molecules to form IMFs that match the type and strength of the targets.

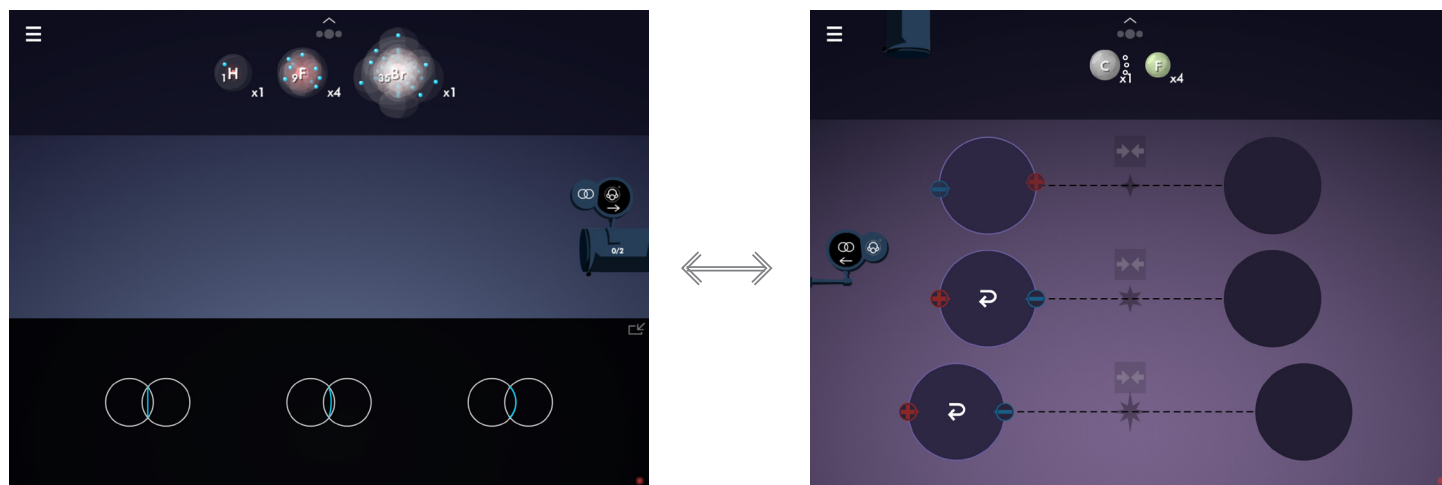
The screenshot displays the game interface for building molecules. At the top, a 'Limited bank of atoms' contains 3 carbon (C) atoms, 3 oxygen (O) atoms, and 6 chlorine (Cl) atoms. Below this, three 'Level targets' are shown, each consisting of two dark circular containers connected by a dashed line. The targets are labeled with intermolecular force types: LDF, LDF, and D-D. The bottom target is partially filled with a blue dipole and two red positive charges. A question mark icon is visible in the top right corner of the game area.

Intermolecular Forces: Overview (cont.)

ATOMS to IMFS CONNECTED LEVELS GOAL: There are atoms missing from the bank. Use the button on the left to go to Atoms. Solve the Challenge and bring back the missing atoms!

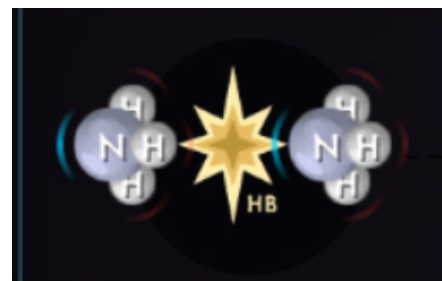


COVALENT BONDING to IMFS CONNECTED LEVELS GOAL: There are molecules missing from the bank. Use the button on the left to go to Covalent Bonding. Solve the Challenge and bring back the missing molecules!



Intermolecular Forces: Chemistry Connections

CHEMISTRY CONCEPT: Intermolecular forces (IMFs) are interactions between two atoms or molecules.



CHEMISTRY CONCEPT: Polar and Nonpolar Molecules



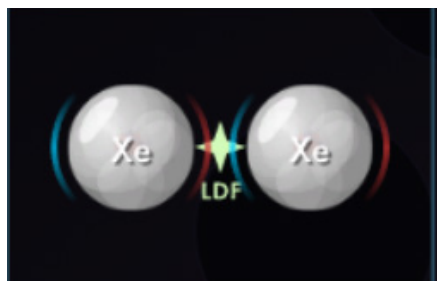
A polar molecule is not symmetrical and has an uneven distribution of electrons.



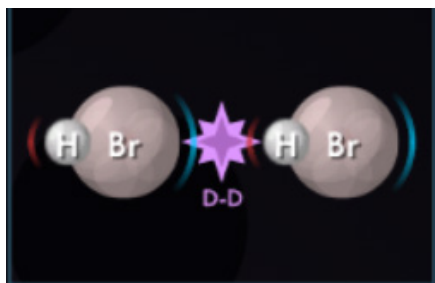
A non-polar molecule is symmetrical and has an even distribution of electrons.


Intermolecular Forces: Chemistry Connections (cont.)

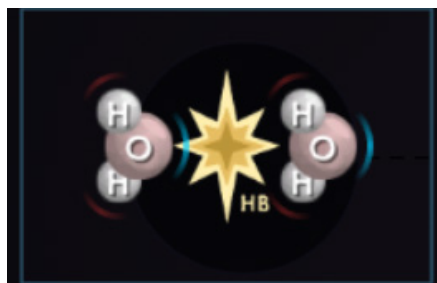
CHEMISTRY CONCEPT: IMF Types




London Dispersion Forces () are temporary dipoles resulting from the constant movement of electrons.



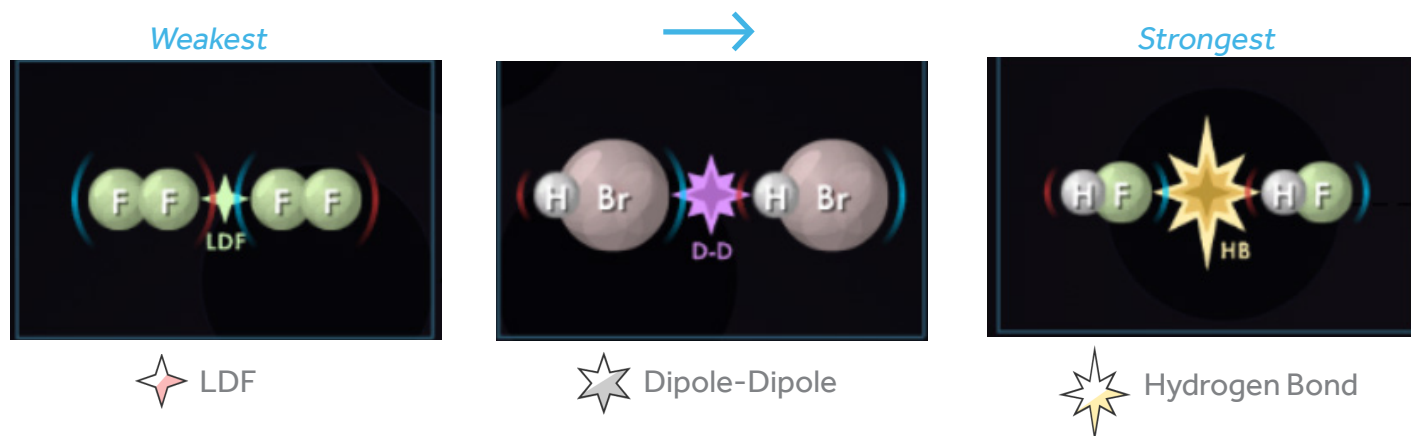
Dipole-Dipole () interactions result between two polar molecules.



Hydrogen Bonding () results from the attractive force between a hydrogen atom covalently bonded to a very electronegative atom such as an N, O, or F atom and another very electronegative atom.

Intermolecular Forces: Chemistry Connections (cont.)

CHEMISTRY CONCEPT: IMF Strength Comparison



CHEMISTRY CONCEPT: LDF strength increases as the number of electrons increase.

