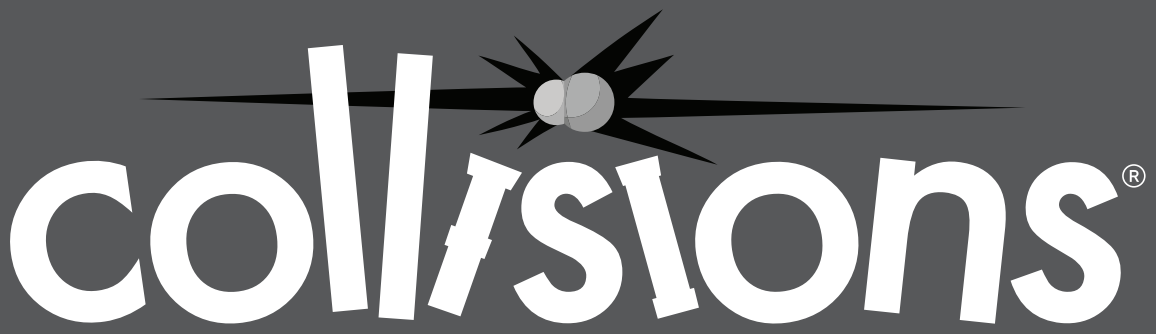
playmada games™



Acids & Bases Game Guide

Acids & Bases Snapshot

Challenges

The ChallengeLevels increase in rigor and complexity.

The first 2 levels are tutorial levels.

- 10 core levels
- 3 connected levels to Covalent Bonding

Sandbox*

The Sandbox is an exploratory learning space for extended practice and review of acids & bases.

- 14 Achievements

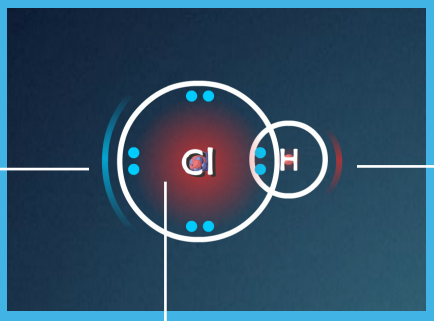
* Players must complete Challenge Levels 1-2 before unlocking the Sandbox.

Integrated Chemistry Concepts

- Brønsted-Lowry acids and bases
- Strong vs. weak acids
- Neutralization reactions
- Amphoteric substances

General Information

Sample Acid

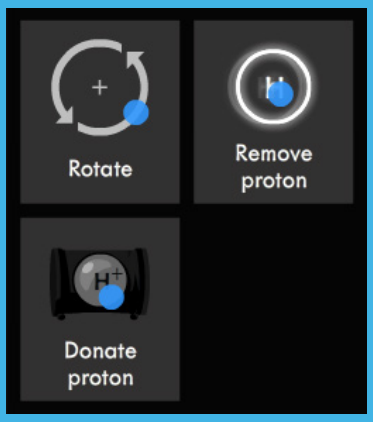


Partial negative charge

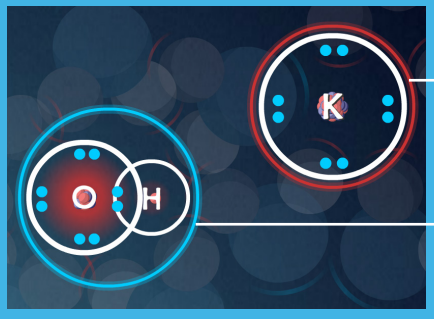
Partial positive charge

Red glow = electronegativity

Skills



Sample Base

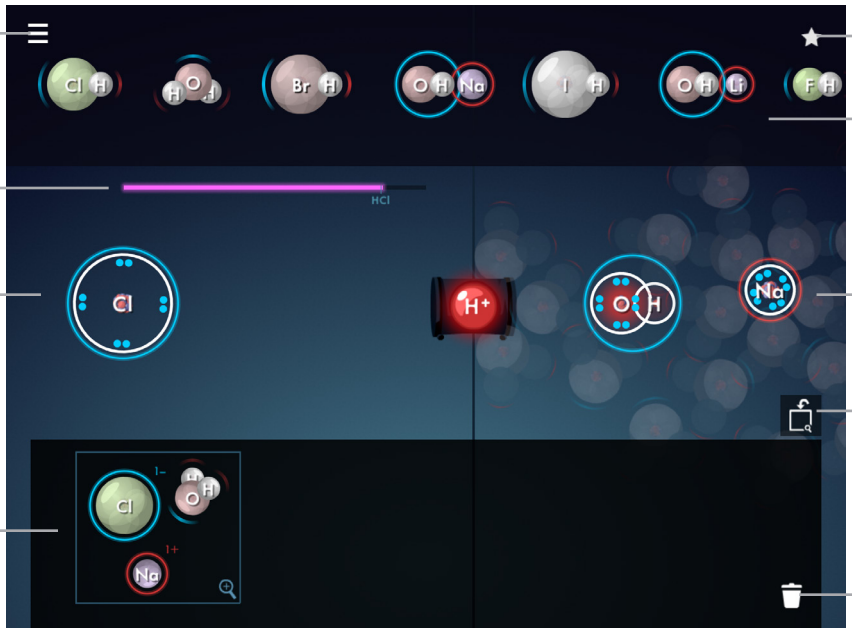


Red charge ring = positively charged ion

Blue charge ring = negatively charged ion

Acids & Bases: Overview

Acids & Bases Sandbox



Achievements

- Remove H^+ from acid
- Add H^+ to base
- Ionize HCl
- Use NaOH to create H_2O
- Use HBr to create H_2O
- Remove H^+ from a strong acid
- Remove H^+ from a weak acid
- Use a weak acid to create H_2O
- Ionize an acid stronger than HBr
- Ionize an acid weaker than HCl
- Form H_3O^+
- Use H_2O as an acid
- Use H_2O as a base
- Form SO_4^{2-}

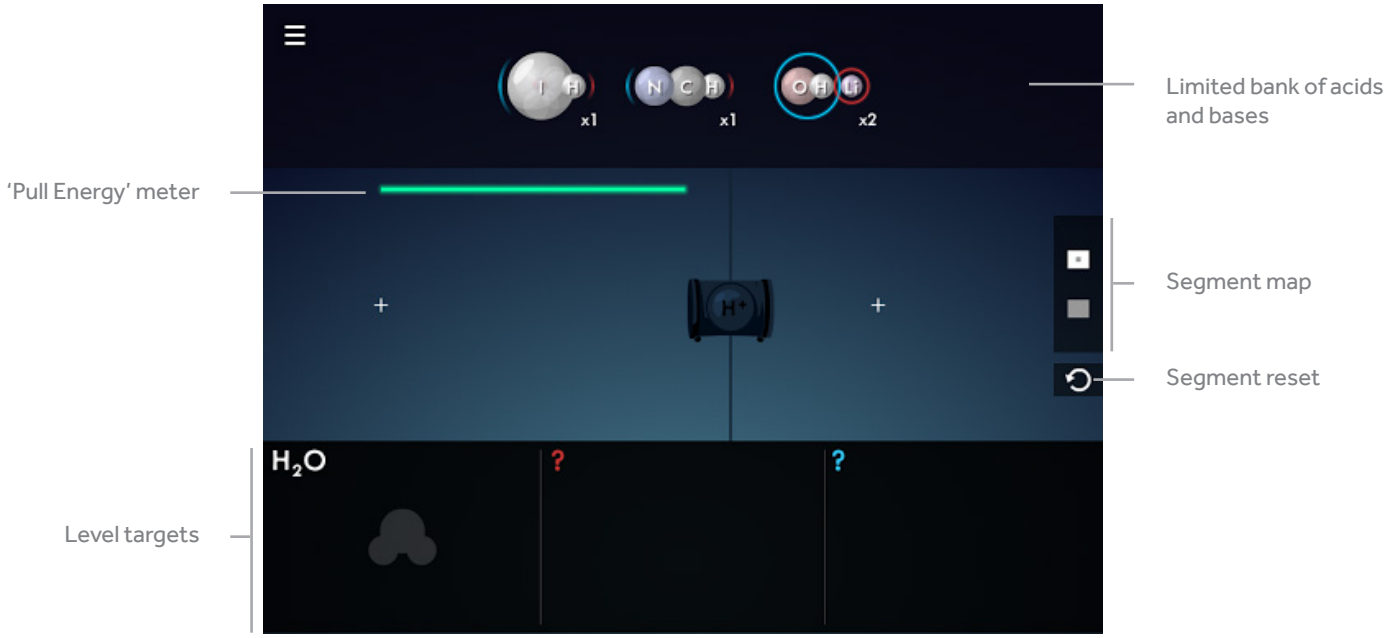
Selected Bank of Acids & Bases

- HI
- HBr
- HCl
- HF
- H_2CO_3
- H_2SO_4
- H_2S
- HCN
- HNO_3
- NaOH
- NH_3
- LiOH
- KOH
- $Mg(OH)_2$
- H_2O

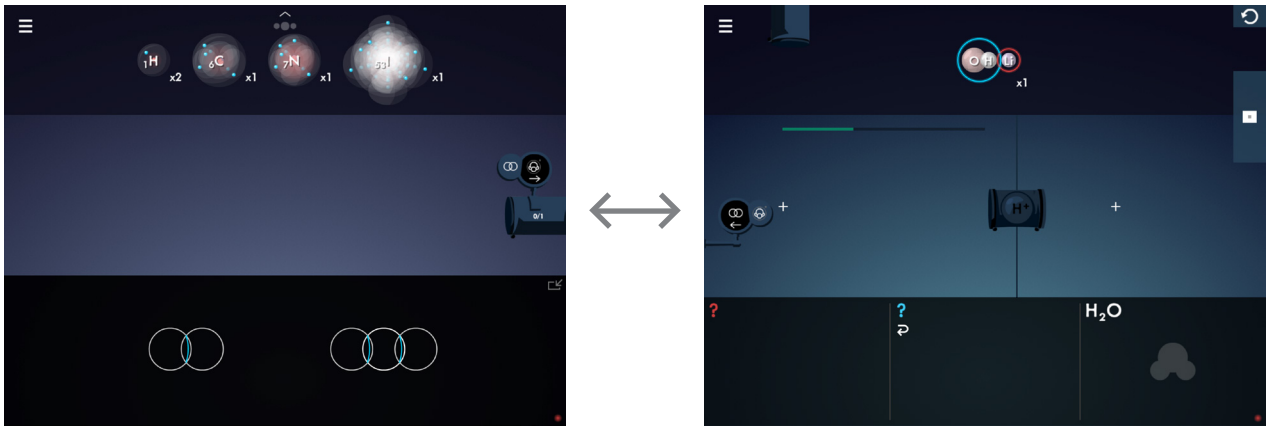
Acids & Bases: Overview (cont.)

Acids & Bases Challenges

LEVELS 1-10 GOAL : Remove or add protons to the acids and bases in the bank in order to match the targets.



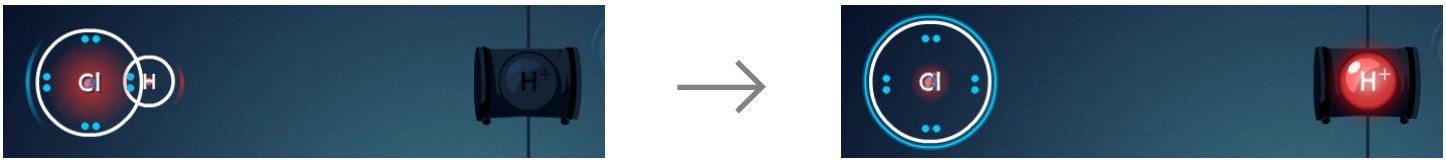
COVALENT BONDING to ACIDS & BASES CONNECTED LEVELS GOAL: Some molecules are missing from the bank. Use the button on the left to go to Covalent Bonding. Solve the challenge to bring back the missing molecules!



Acids & Bases: Chemistry Connections

CHEMISTRY CONCEPT: An acid can donate a proton to another substance. (Brønsted-Lowry)

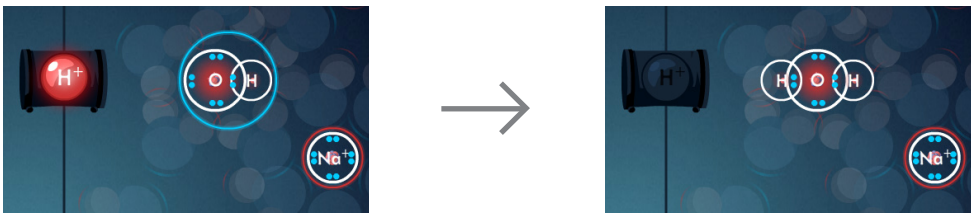
$$HCl \longrightarrow H^+ + Cl^-$$



A conjugate base is formed after an acid donates a proton.

CHEMISTRY CONCEPT: A base can accept a proton from another substance. (Brønsted-Lowry)

$$NaOH + H^+ \longrightarrow H_2O + Na^+$$



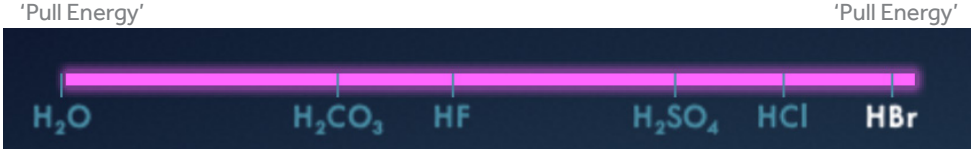
A conjugate acid is formed after a base accepts a proton.

CHEMISTRY CONCEPT: Acid strength correlates to the ease in which a molecule can donate a proton.

The *Pull Energy Meter* represents the 'ease' in which various acids are able to donate protons.

Requires more 'Pull Energy'

Requires less 'Pull Energy'



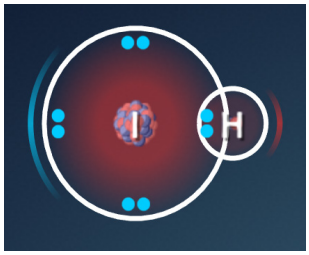
Weak Acids

Strong Acids

The harder it is to remove a proton from an acid, the weaker the acid.

H_2O is a weak acid.

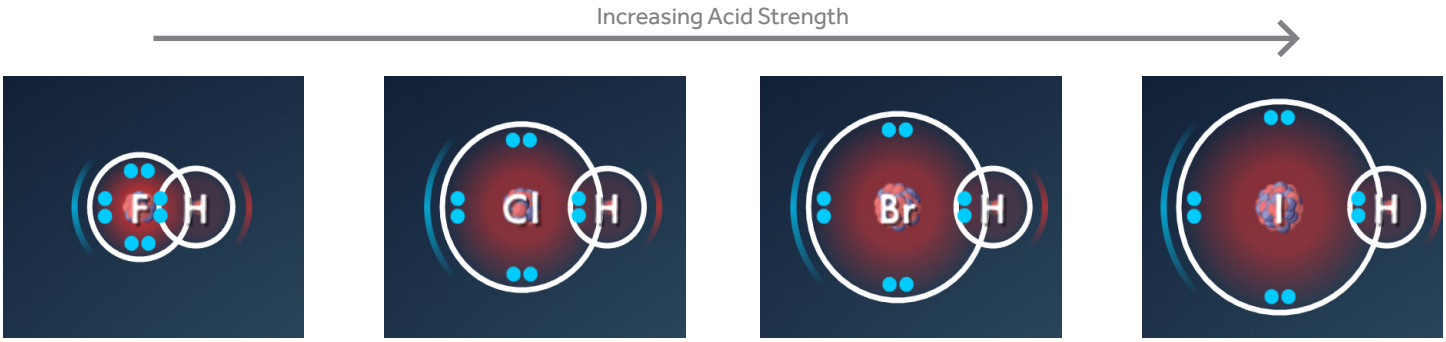
The easier it is to remove a proton from an acid, the stronger the acid.



HI is a strong acid.

Acids & Bases: Chemistry Connections (cont.)

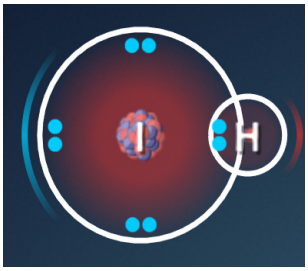
CHEMISTRY CONCEPT: Acid strength increases as atomic radius increases.

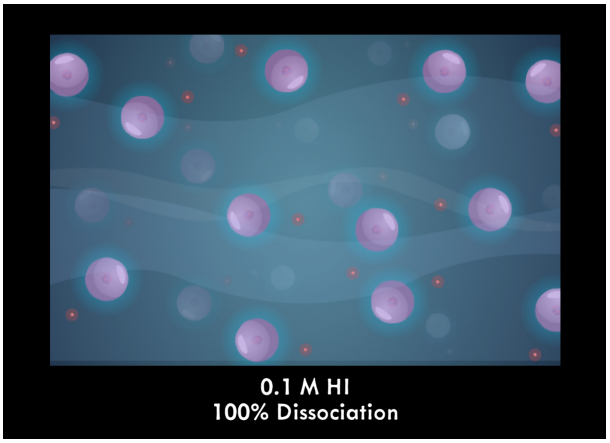


CHEMISTRY CONCEPT: The amount of ionization differs between strong and weak acids.

A strong acid completely ionizes in water.

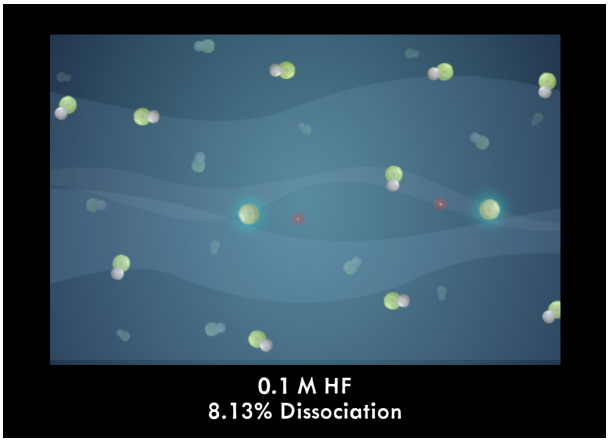
HI is a strong acid.





A weak acid partially ionizes in water.

HF is a weak acid.



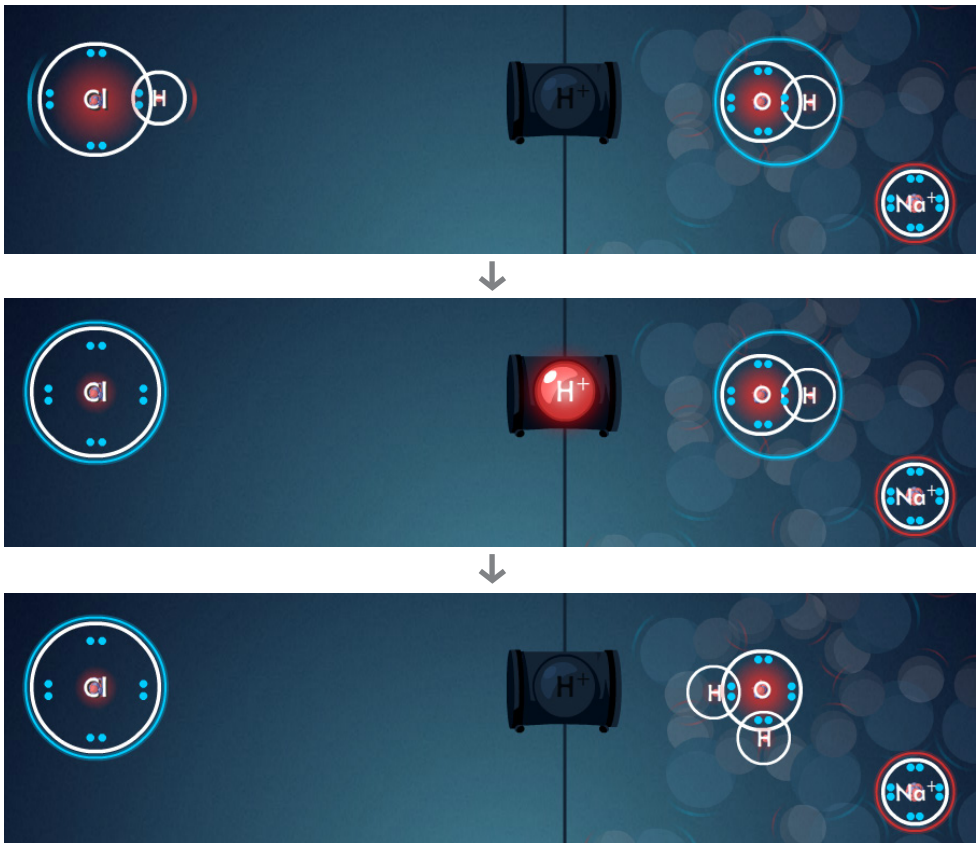
Acids & Bases: Chemistry Connections (cont.)

CHEMISTRY CONCEPT: A polyprotic acid can donate more than one proton to another substance.

A polyprotic acid donates its 1st proton more easily than its 2nd proton.

CHEMISTRY CONCEPT: In a neutralization reaction, an acid and a base react to form water and an ionic salt.

$$HCl + NaOH \longrightarrow H_2O + Na^+_{(aq)} + Cl^-_{(aq)}$$

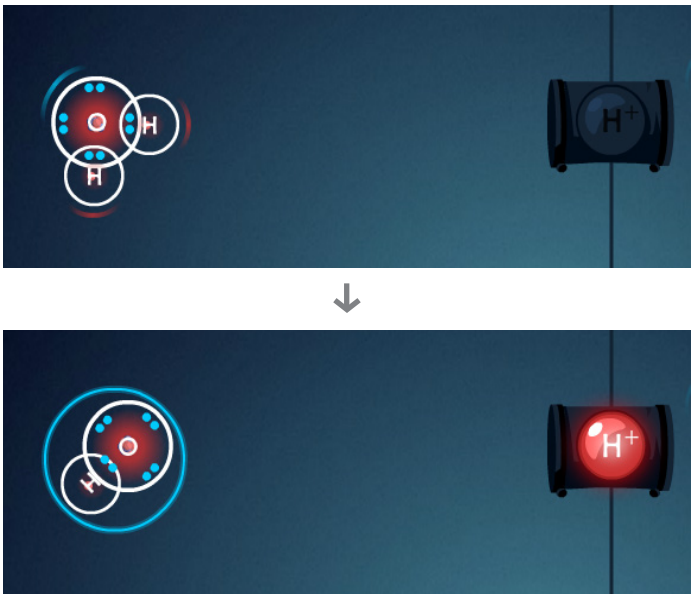


Acids & Bases: Chemistry Connections (cont.)

CHEMISTRY CONCEPT: A substance that can act either as an acid or a base is amphoteric.

H_2O is an amphoteric substance.

H_2O can behave as an acid.



H_2O can behave as a base.