



CONTENT AREA OVERVIEW

Acid Strength

pH 7

pH 4

playmada™



SNAPSHOT

Challenges

- The Challenge Levels increase in rigor and complexity.
- The first 7 levels are tutorial levels.
 - 16 core levels
 - 3 connected levels to Lewis Structures

Sandbox

- The Sandbox is an exploratory learning space for extended practice and review of the Acid Strength game.
- 14 Achievements

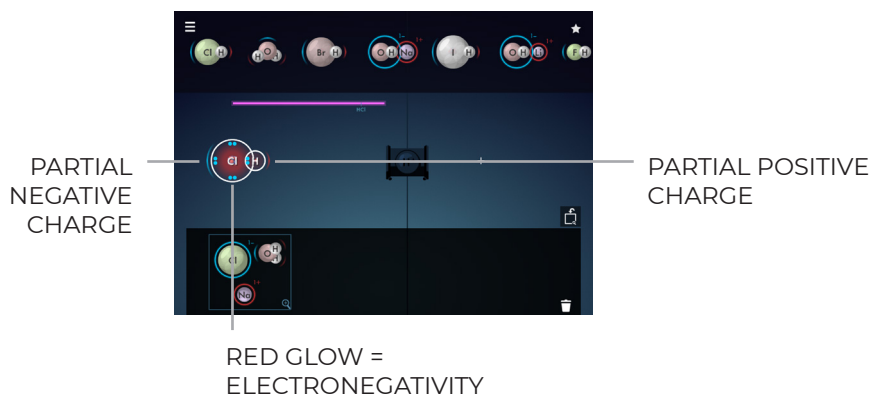
Integrated Chemistry Concepts

- Brønsted-Lowry acids and bases
- Electronegativity differences
- Strong vs. weak acids
- Polyprotic acids
- Percent dissociation
- Neutralization reactions
- Amphoteric substances
- Conjugate acids and bases
- Charge of resulting ions

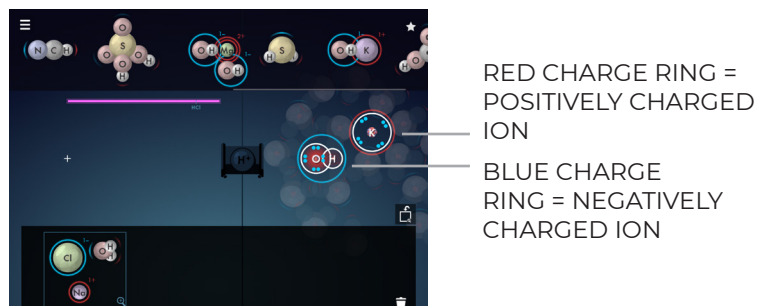


GAMEPLAY BASICS

Sample Acid



Sample Base



Skills

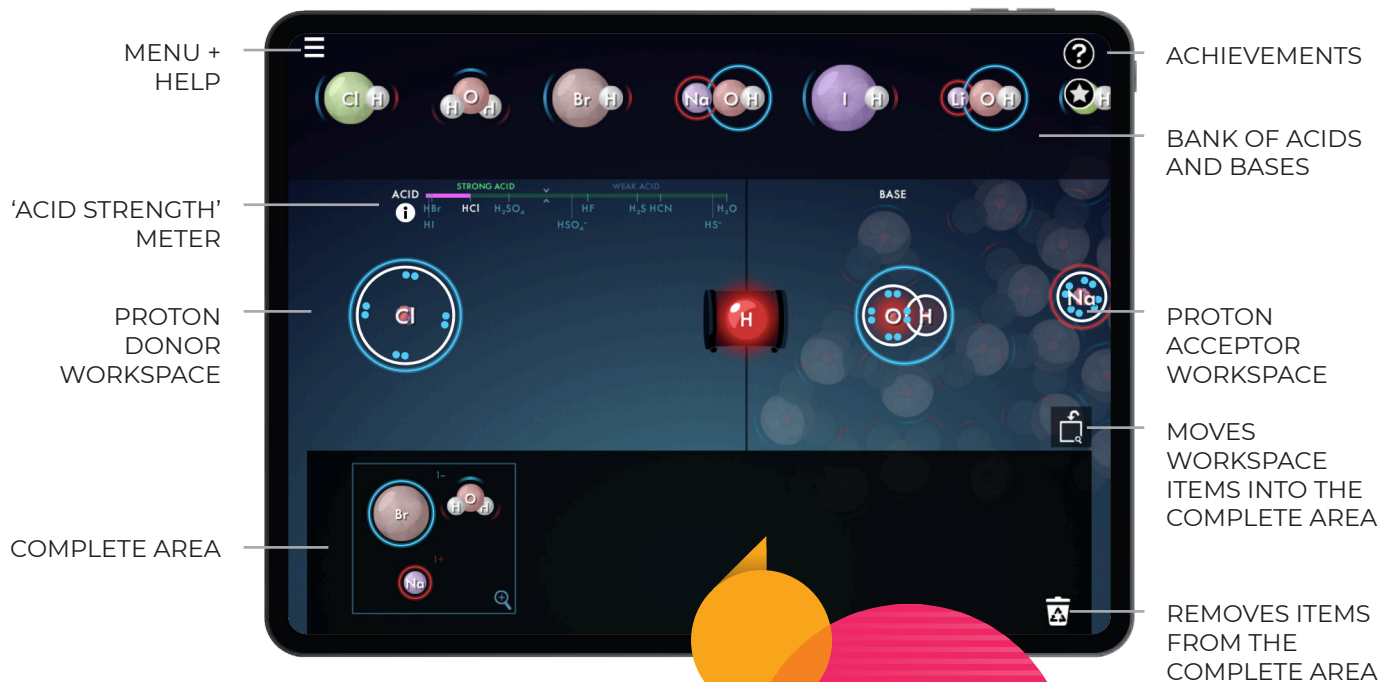
Remove proton
Press & drag H

Rotate base
Tap base, then rotate

Donate proton
Tap H⁺ button



OVERVIEW



Achievements

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

Acid Strength Sandbox

Selected Bank of Acids & Bases

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



OVERVIEW

Acid Strengths Challenges

'ACID STRENGTH' METER

LEVEL TARGETS



CHEMISTRY CONCEPT:

All reactions can proceed in the forward and reverse directions.

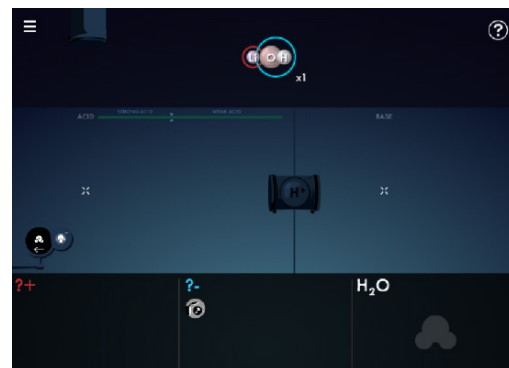
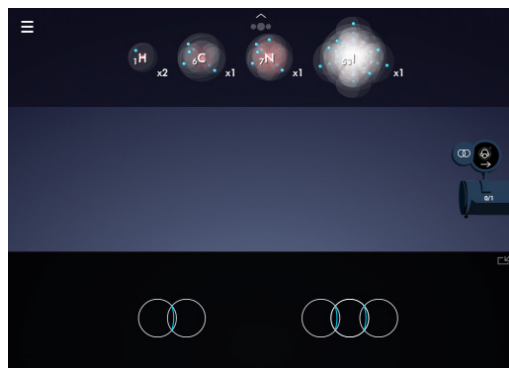


LIMITED BANK OF ACIDS AND BASES

SEGMENT MAP

LEWIS STRUCTURES TO ACID STRENGTH CONNECTED LEVELS GOAL:

Some molecules are missing from the bank. Use the button on the left to go to Lewis Structures. Solve the challenge to bring back the missing molecules!



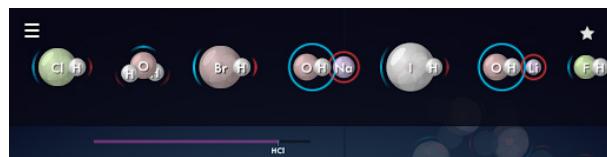
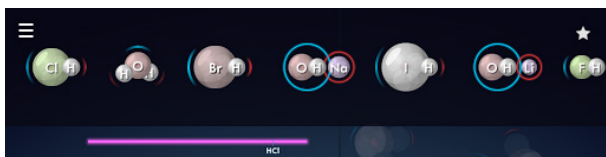


CHEMISTRY CONNECTIONS

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CHEMISTRY CONCEPT:

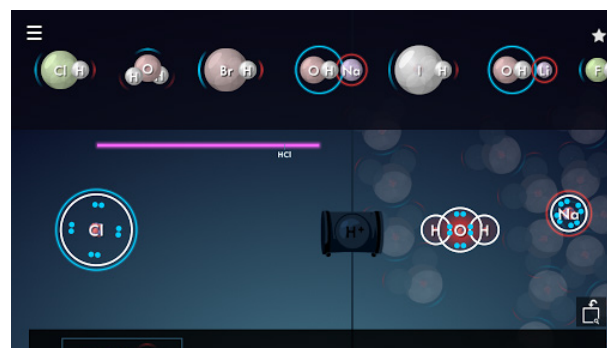
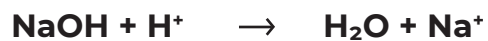
A Brønsted-Lowry acid can donate a proton to another substance.



A CONJUGATE BASE IS FORMED AFTER AN ACID DONATES A PROTON.

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

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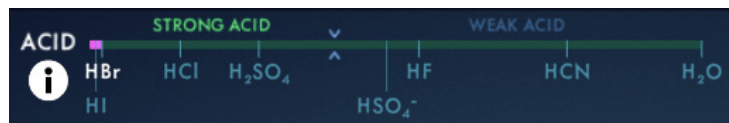


A CONJUGATE ACID IS FORMED AFTER A BASE ACCEPTS A PROTON.



CHEMISTRY CONNECTIONS

THE ACID STRENGTH METER REPRESENTS THE 'EASE' IN WHICH ACIDS ARE ABLE TO DONATE PROTONS.



CHEMISTRY CONCEPT:

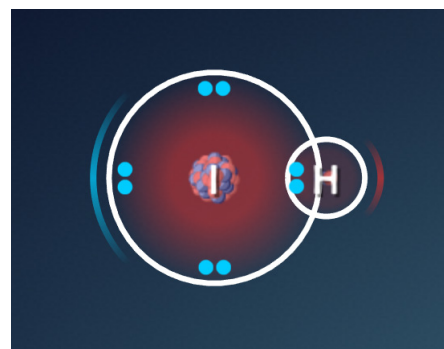
Acid strength correlates to the ease in which a molecule can donate a proton.

THE HARDER IT IS TO REMOVE A PROTON FROM AN ACID, THE WEAKER THE ACID.



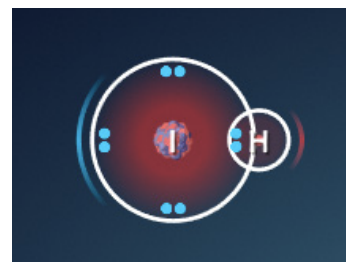
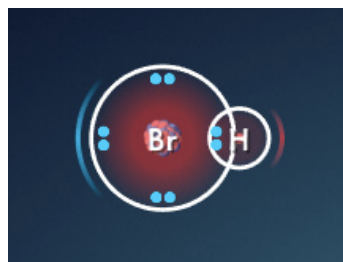
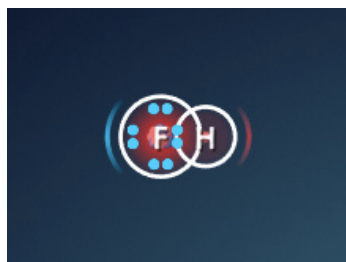
H₂O IS A WEAK ACID, THEREFORE PROTON REMOVAL REQUIRES A HIGH AMOUNT OF ENERGY.

THE EASIER IT IS TO REMOVE A PROTON FROM AN ACID, THE STRONGER THE ACID.



HI IS A STRONG ACID, THEREFORE PROTON REMOVAL REQUIRES A LOW AMOUNT OF ENERGY.

CHEMISTRY CONCEPT:
Acid strength increases as atomic radius increases.



INCREASING ACID STRENGTH



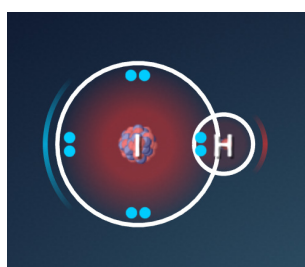
CHEMISTRY CONNECTIONS

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CHEMISTRY CONCEPT:

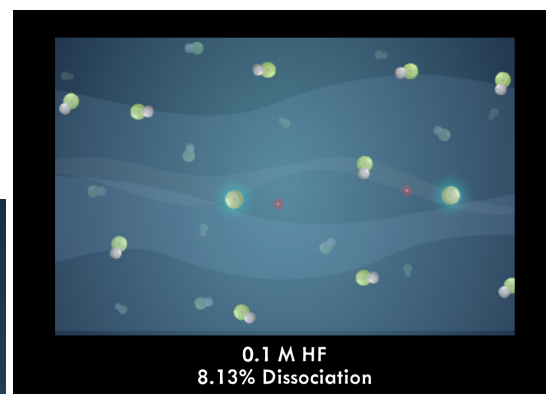
The amount of ionization differs between strong and weak acids.

A **STRONG ACID**
COMPLETELY IONIZES IN WATER

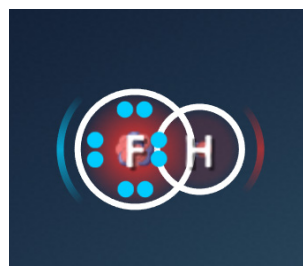


HI IS A STRONG ACID.

A **WEAK ACID**
PARTIALLY IONIZES IN WATER



0.1 M HF
8.13% Dissociation

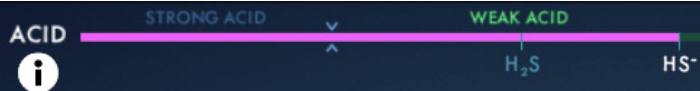


HF IS A WEAK ACID.

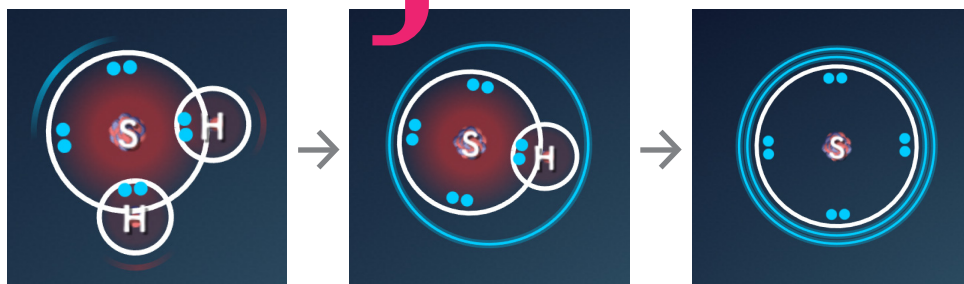
CHEMISTRY CONCEPT:

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

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A POLYPROTIC ACID DONATES ITS 1ST PROTON MORE EASILY THAN ITS 2ND PROTON.





CHEMISTRY CONNECTIONS



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CHEMISTRY CONCEPT:

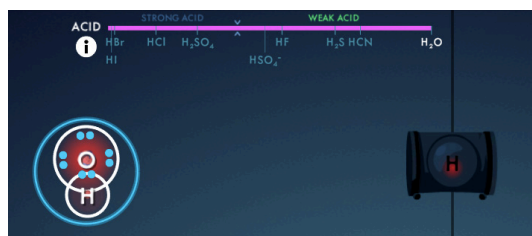
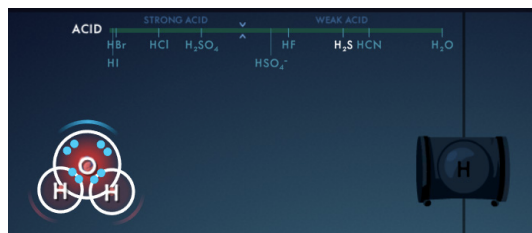
In a neutralization reaction, an acid and a base react to form water and an ionic salt.

CHEMISTRY CONCEPT:

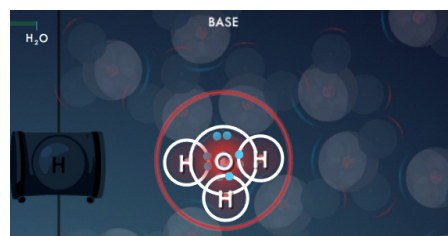
A substance that can act either as an acid or a base is amphoteric.

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H₂O CAN BEHAVE AS AN ACID.



H₂O CAN BEHAVE AS A BASE.



H₂O IS AN
AMPHOTERIC
SUBSTANCE.