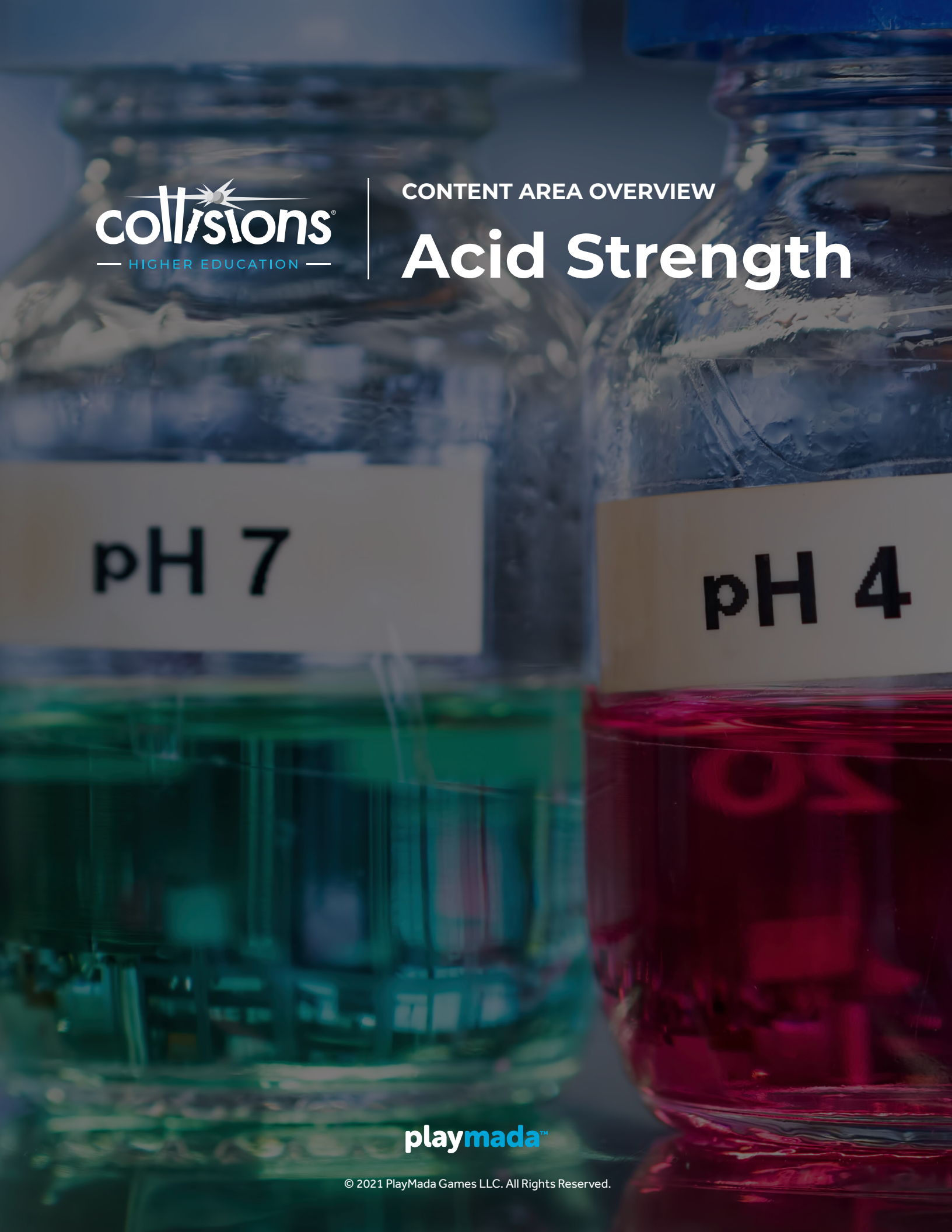


collisions
HIGHER EDUCATION

CONTENT AREA OVERVIEW

Acid Strength

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

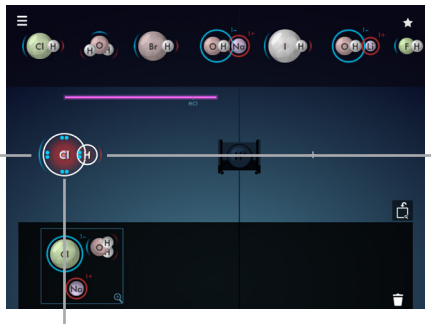
- The Sandbox is an exploratory learning space for extended practice and review of the Acid Strength game.
- 14 Achievements

Integrated Chemistry Concepts

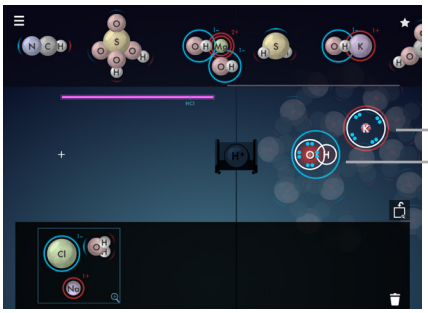
- Brønsted-Lowry acids and bases
- Electronegativity differences
- Strong vs. weak acids
- Polyprotic acids
- Percent dissociation
- Neutralization reactions
- Amphoteric substances
- Conjugate acids and bases
- Charge of resulting ions

GAMEPLAY BASICS

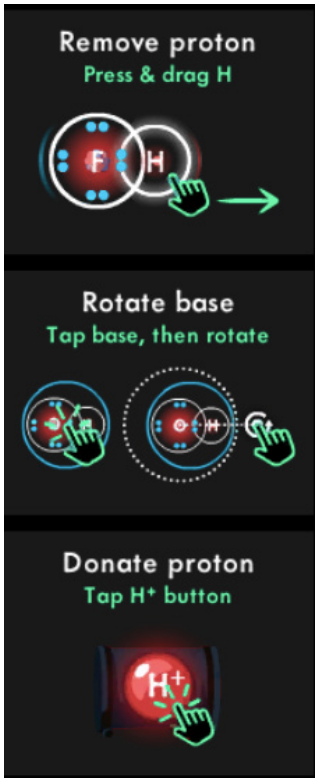
Sample Acid



Sample Base



Skills



OVERVIEW

Acid Strength Sandbox

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_30^+
- 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-}

Selected Bank of Acids & Bases

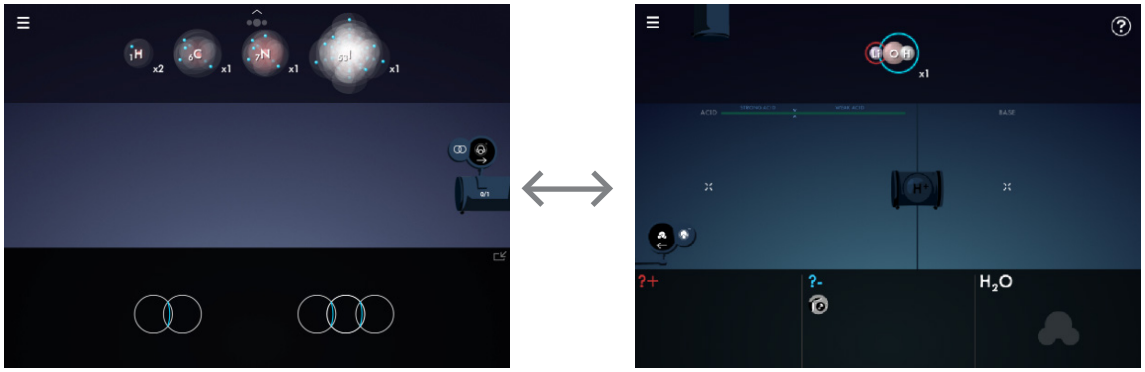
HI	NaOH
HBr	NH_3
HCl	LiOH
HF	KOH
H_2CO_3	$Mg(OH)_2$
H_2SO_4	H_2O
H_2S	
HCN	
HNO_3	

OVERVIEW

CHEMISTRY CONCEPT:
All reactions can proceed in the forward and reverse directions.

Acid Strengths Challenges

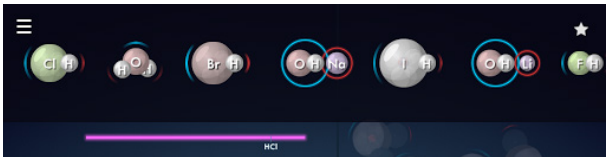
LEWIS STRUCTURES TO ACID STRENGTH CONNECTED LEVELS GOAL:
Some molecules are missing from the bank. Use the button on the left to go to Lewis Structures. Solve the challenge to bring back the missing molecules!

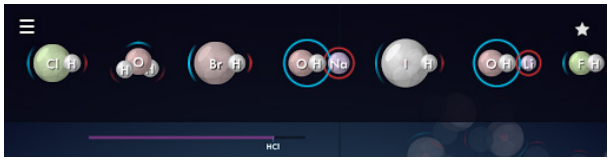


CHEMISTRY CONNECTIONS

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

$$HCl \rightarrow H^+ + Cl$$

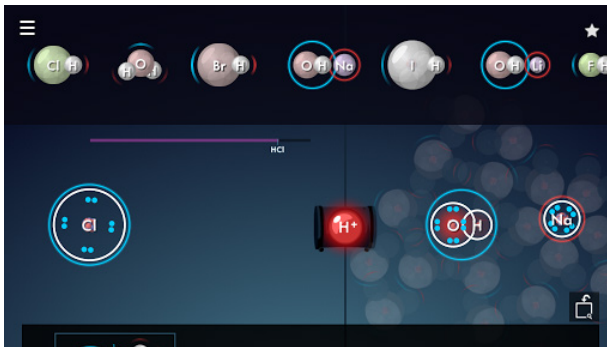


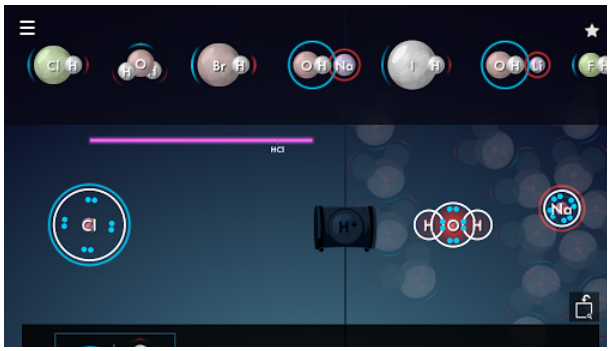


A CONJUGATE BASE IS FORMED AFTER AN ACID DONATES A PROTON.

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

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





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

CHEMISTRY CONNECTIONS

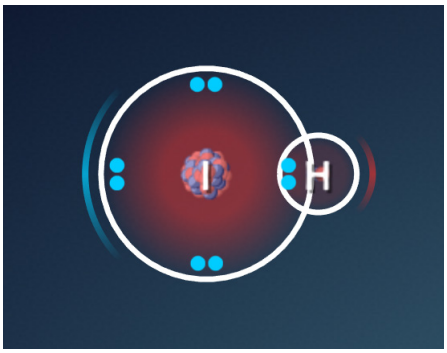
THE ACID STRENGTH METER REPRESENTS THE 'EASE' IN WHICH ACIDS ARE ABLE TO DONATE PROTONS.

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.

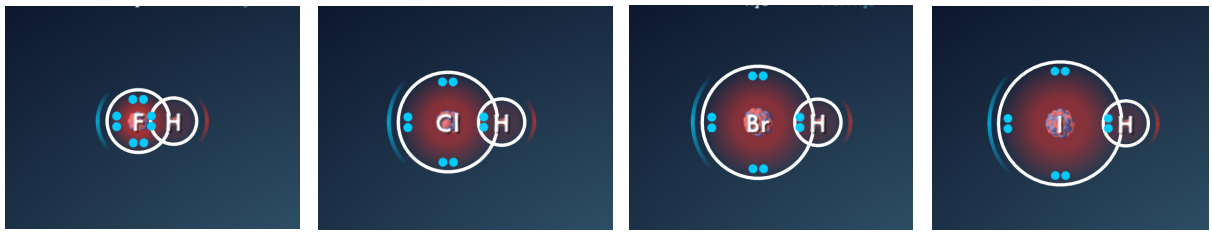
H_2O IS A WEAK ACID, THEREFORE PROTON REMOVAL REQUIRES A HIGH AMOUNT OF ENERGY.

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.

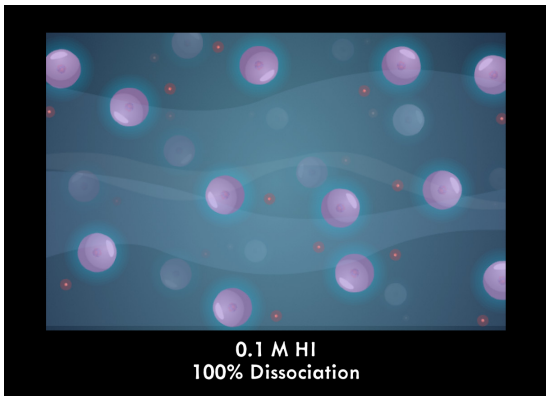


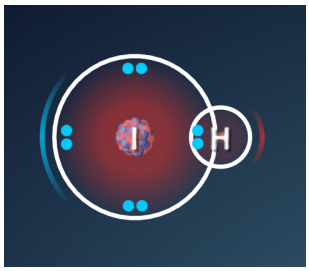
INCREASING ACID STRENGTH

CHEMISTRY CONNECTIONS

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

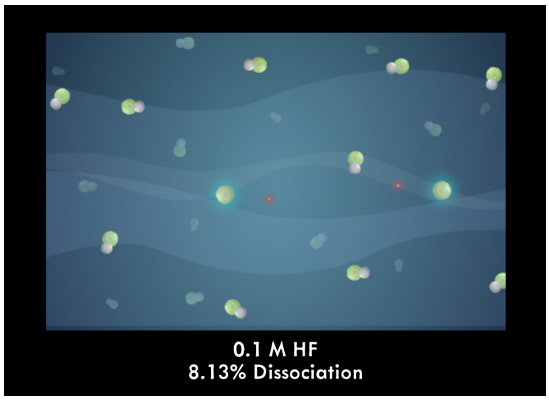
A **STRONG ACID**
COMPLETELY IONIZES IN WATER





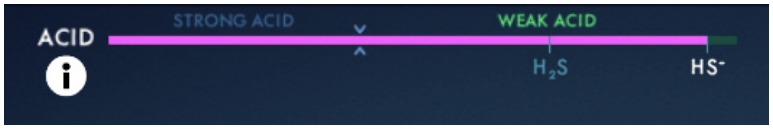
HI IS A STRONG ACID.

A **WEAK ACID**
PARTIALLY IONIZES IN WATER



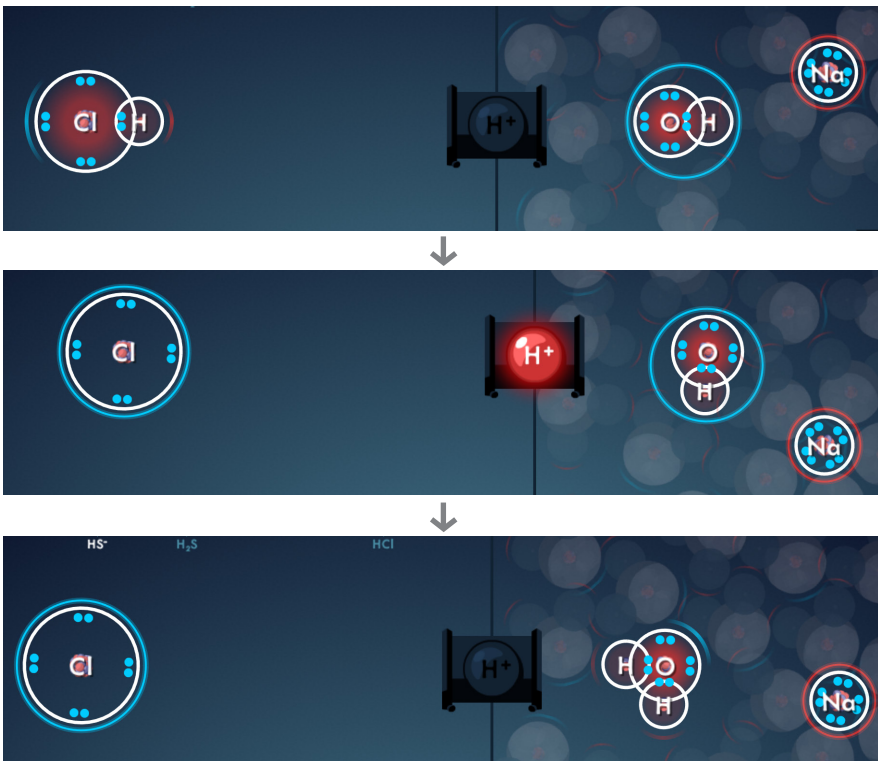
HF IS A WEAK ACID.

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 CONNECTIONS



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

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.

H_2O IS AN AMPHOTERIC SUBSTANCE.

H_2O CAN BEHAVE AS AN ACID.

H_2O CAN BEHAVE AS A BASE.