



collisions™

General Game Guide

Collisions: General Game Guide

Audience: Middle and high school

Subject: Chemistry

Pricing: Subscription model

Platform: Android, iOS, web version

About Collisions

Collisions is a system of interconnected digital chemistry games designed to give school students a deepened understanding of fundamental chemistry concepts through play.

- Collisions encourages exploration by offering a safe environment for players to make mistakes and learn from these mistakes.
 - The rules of Collisions are grounded in the rules of chemistry. As students learn to play the game, they simultaneously learn chemistry.
 - Collisions emphasizes the interconnected nature of chemistry. Just like in chemistry, the Collisions games are interconnected.
 - Designed as modular spaces, the Collisions games can be used flexibly to both introduce a lesson and review concepts.
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Curriculum Integration

Collisions includes the following robust games:

- Acids & Bases
 - Intermolecular Forces
 - Ions
 - Atoms
 - Ionic Bonding
 - Phase Change
 - Covalent Bonding
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Standards Alignment

Collisions is aligned to specific standards from the following sources:

- Next Generation Science Standards
 - For alignment to your state's standards, email educators@playmadagames.com.
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Collisions Overview

Integrated Chemistry Concepts

Atoms

- Proton # = electron #
- Electron Configuration
- Aufbau Principle
- Hund's Rule
- Periodic trends

Covalent Bonding

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

Acids & Bases

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

Phase Change

- 6 phase changes
- Breaking/forming IMFs
- Constant temperature during a phase change
- IMF strength & boiling point

Ions

- Cation and anion formation
- Octet rule
- Ionic radii
- Ionization energy

Ionic Bonding

- Ion attraction
- Ionic compounds contain 1 type of cation and 1 type of anion
- Ionic compound neutrality
- Ionic ratios

Intermolecular Forces

- Polar vs. nonpolar compounds
- Types of IMFs (London Dispersion Forces, Dipole-Dipole, Hydrogen Bond)
- IMF strength

Sandbox

Each Collisions game includes an exploratory Sandbox designed for extended practice and review of specific chemistry content.

The Sandbox will unlock upon completion of the tutorial levels.

Achievements (25 - 45 minutes)

Each Sandbox includes a unique set of Achievements for students to work through. These Achievements will introduce and/or review important chemistry concepts. As the instructor, you can have students work through all Achievements or assign specific Achievements that align with your lesson's objective.

Extended Play

In addition to the Achievements, we encourage you to use the Sandbox in a manner that most complements your instructional method.

Collisions Overview (cont.)

Challenges

Each Collisions game has a series of Challenges. The first level(s) of each game include a tutorial to introduce players to the game mechanics. Subsequent levels unlock upon successful completion of the previous level. The connected levels bridge content from two games together, challenging students to draw connections and further explore how different chemistry concepts affect one another. The connected levels unlock upon successful completion of the associated core levels.

Atoms

Players build a series of atoms of increasing atomic radii.

- 11 core levels

Covalent Bonding

Players build molecules to match target bond polarities & geometries.

- 11 core levels
- 4 connected levels to Atoms

Acids & Bases

Players add & remove protons to create target ions & molecules.

- 10 core levels
- 3 connected levels to Covalent Bonding

Phase Change

Players cause phase changes by adding & removing energy to affect motion & IMFs.

- 11 core levels
- 3 connected levels to Ionic Bonding
- 3 connected levels to Intermolecular Forces

Ions

Players add or remove electrons to form target ions.

- 7 core levels
- 3 connected levels to Atoms

Ionic Bonding

Players use ions to build compounds of target ratios.

- 8 core levels
- 3 connected levels to Ions
- 3 connected levels to Acids & Bases

Intermolecular Forces

Players use single atoms or build molecules to form target IMFs.

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