collisions HIGHER EDUCATION

CONTENT AREA OVERVIEW

Latent Heat

playmada™

SNAPSHOT

Challenges

- The Challenge Levels increase in rigor and complexity.
- The first 7 levels are tutorial levels.
  - 15 core levels
  - 3 connected levels to Ionic Bonding
  - 3 connected levels to Intermolecular Forces

Sandbox

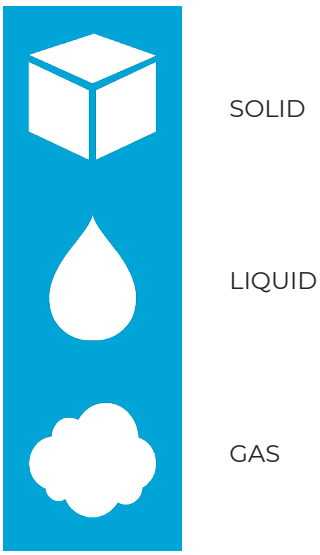
- The Sandbox is an exploratory learning space for extended practice and review of Latent Heat.
- 14 Achievements

Integrated Chemistry Concepts

- Melting/Freezing Point
- Boiling Point/Condensation
- Sublimation/Deposition
- Relative kinetic energy of phases
- Breaking/Forming IMFs
- London Dispersion Forces
- Dipole-Dipole Forces
- Hydrogen Bonds
- Endothermic & Exothermic Processes
- IMFs Strengths and Boiling Points
- IMFs vs. Ionic Bonding

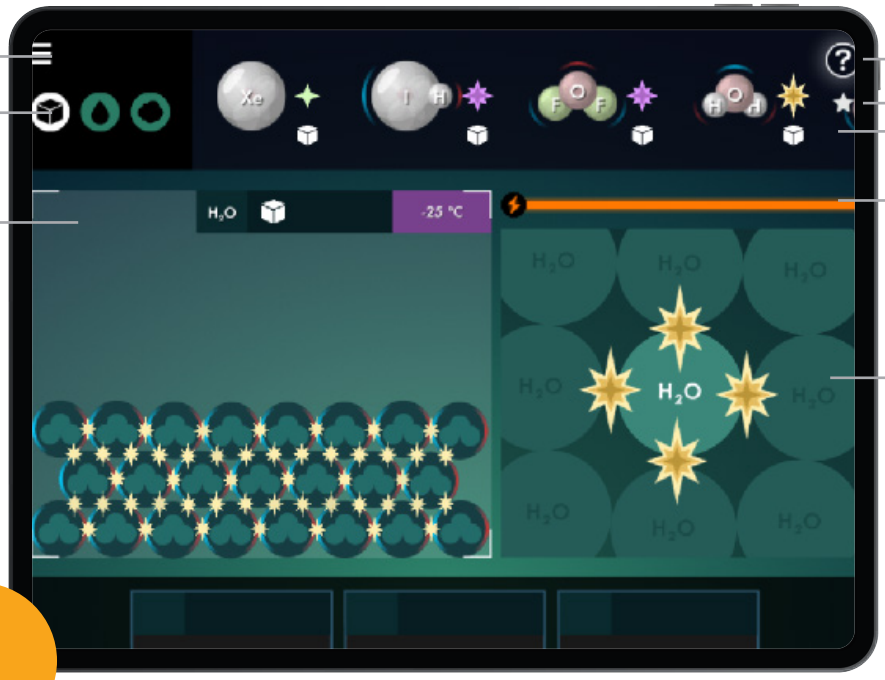
GAMEPLAY BASICS

Phases



Skills

OVERVIEW



Achievements

- Melt
- Freeze
- Condense
- Boil
- Sublime
- Deposit
- Freeze Xe
- Melt NF_3
- Boil H_2O
- Lower boiling point than NH_3
- Higher boiling point than HI
- Exothermic
- Endothermic
- Change energy without changing temperature

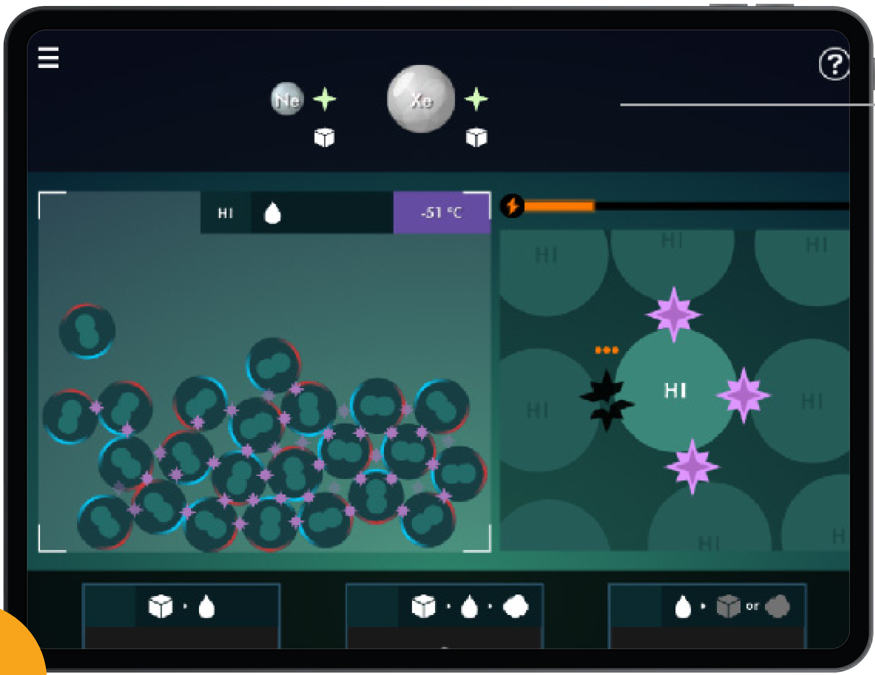
Selected Bank of Particles

Ne
Ar
Xe
HI
OF_2
H_2O
SO_2
CO_2
N_2
NF_3
NH_3
HCN
CH_2O
CH_4
CH_3F
NaCl
MgO

Sandbox Achievements

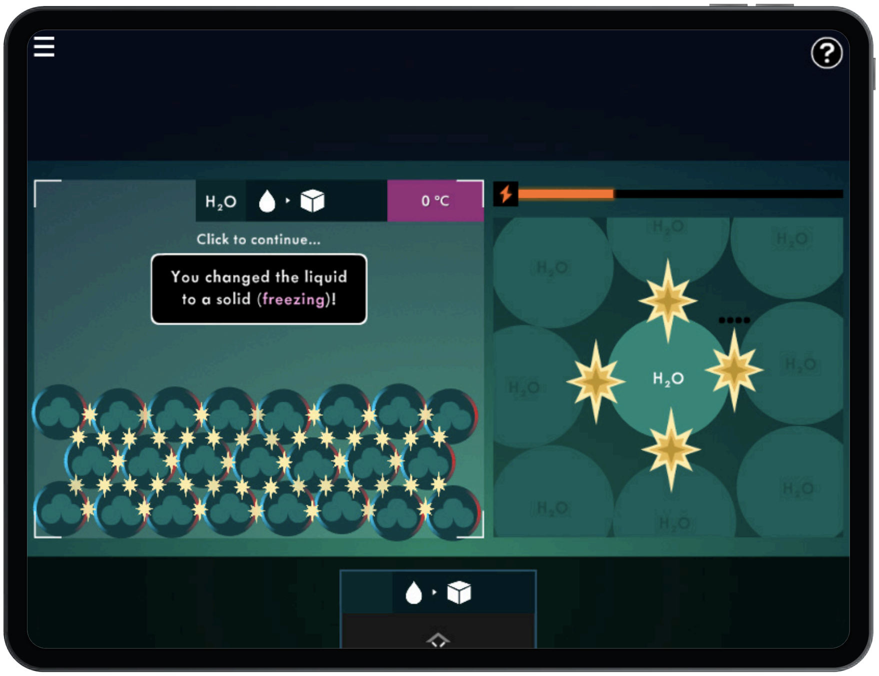
OVERVIEW

Latent Heat Challenges



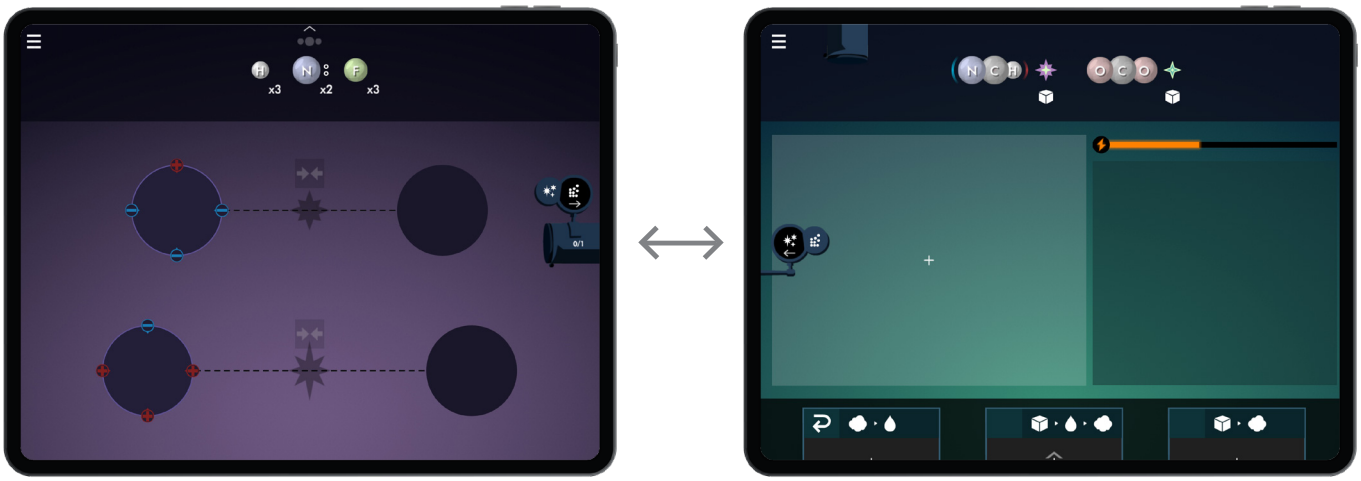
RESTRICTED BANK OF PARTICLES

LEVEL TARGETS

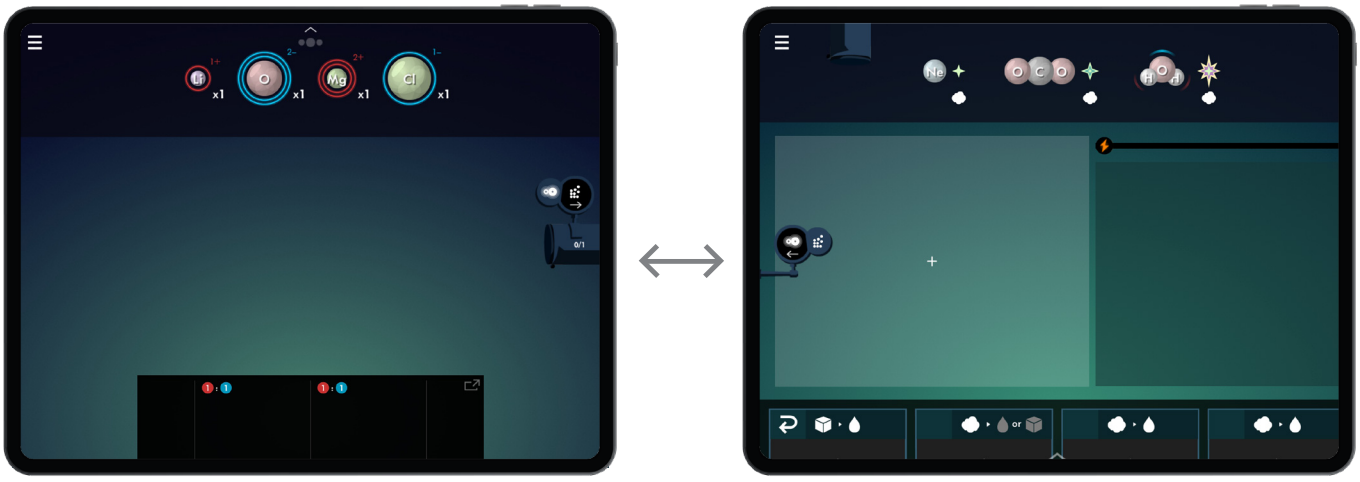


LEVEL GOAL: Cause phase changes in target sequences by adding or removing energy to affect particle motion and to break and form intermolecular forces.

OVERVIEW

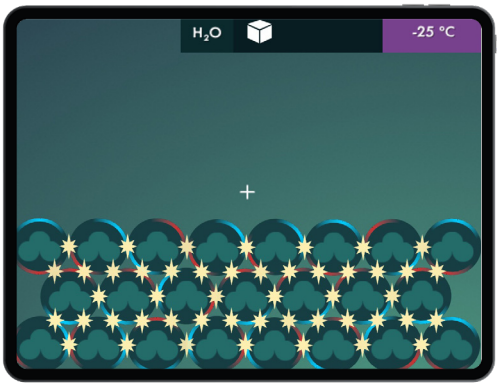


IMFS TO LATENT HEAT CONNECTED LEVELS GOAL: There are particles missing from the bank. Use the button on the left to go to IMFs. Solve the Challenge and bring back the missing particles!

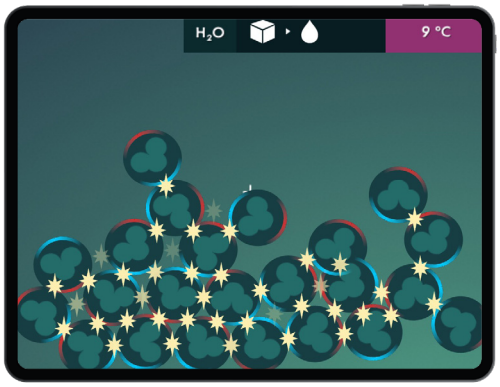


IONIC BONDING TO IMFS CONNECTED LEVELS GOAL: There are ionic compounds missing from the bank. Use the button on the left to go to Ionic Bonding. Solve the Challenge and bring back the missing ionic compounds!

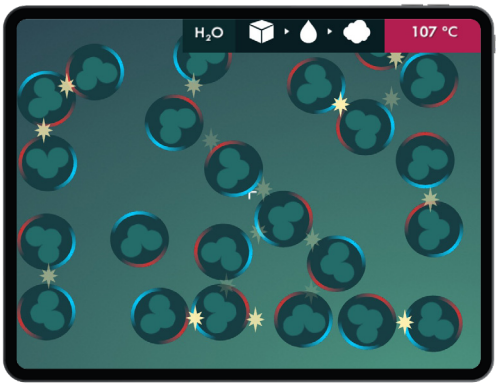
CHEMISTRY CONNECTIONS



SOLID



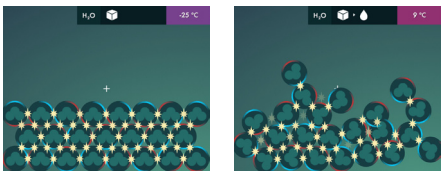
LIQUID



GAS

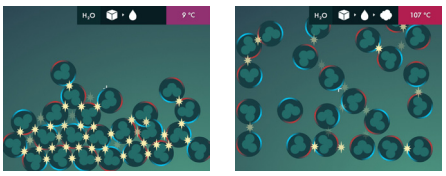
CHEMISTRY CONCEPT:
The motion of particles increases from solid to liquid to gas.

MELTING



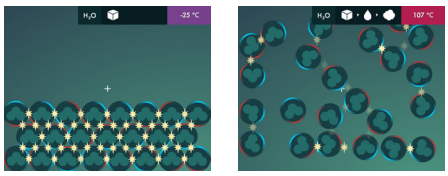
SOLID → LIQUID

BOILING



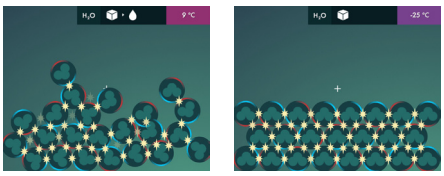
LIQUID → GAS

SUBLIMATION



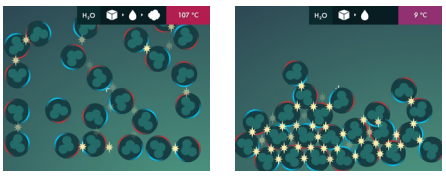
SOLID → GAS

FREEZING



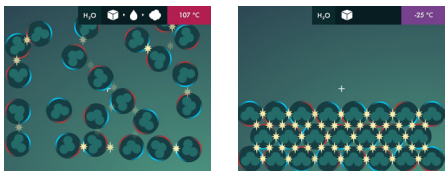
LIQUID → SOLID

CONDENSATION



GAS → LIQUID

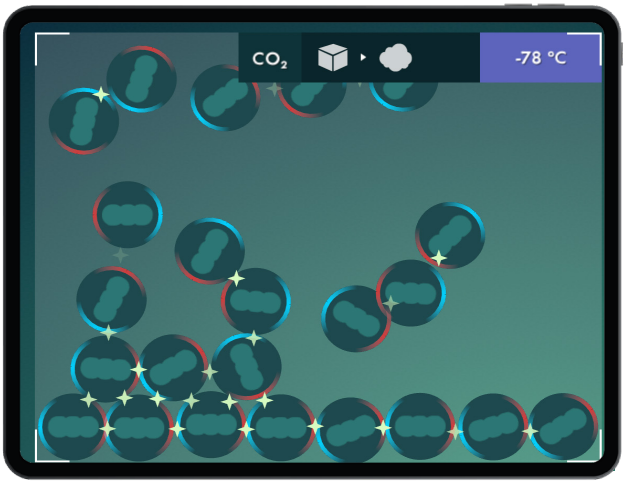
DEPOSITION



GAS → SOLID

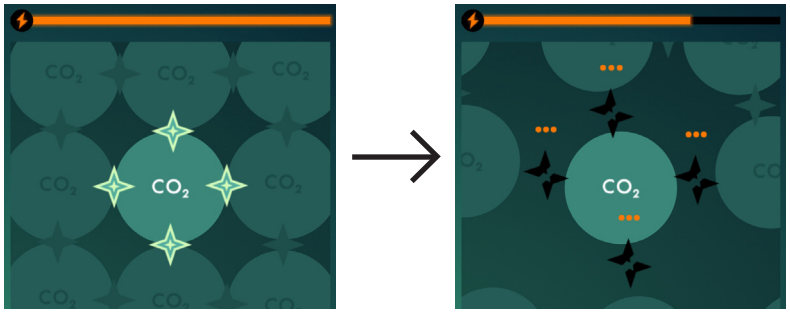
CHEMISTRY CONCEPT:
There are 6 basic types of phase change.

CHEMISTRY CONNECTIONS



CHEMISTRY CONCEPT:
During a phase change, there are two phases present.

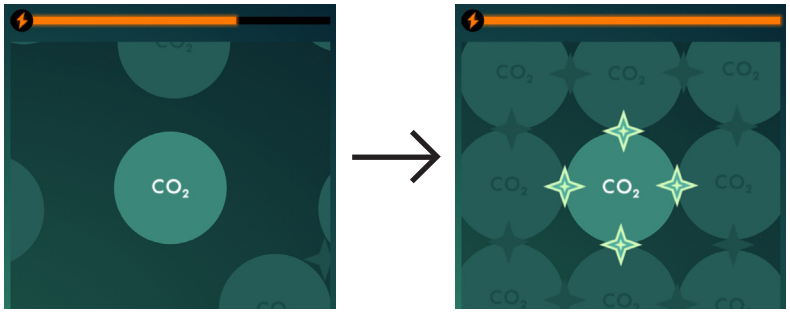
ENERGY (HEAT) IS ABSORBED DURING MELTING, BOILING AND SUBLIMATION AND IMFS ARE BROKEN.



- Energy absorbed
- IMFs broken

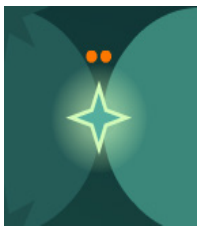
CHEMISTRY CONCEPT:
During phase changes, energy can be absorbed (endothermic) to break IMFs or energy can be released (exothermic) by the formation of IMFs.

ENERGY (HEAT) IS RELEASED DURING FREEZING, CONDENSATION AND DEPOSITION AND IMFS ARE FORMED.

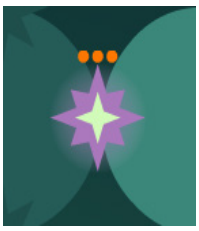


- Energy released
- IMFs formed

CHEMISTRY CONNECTIONS



LDF



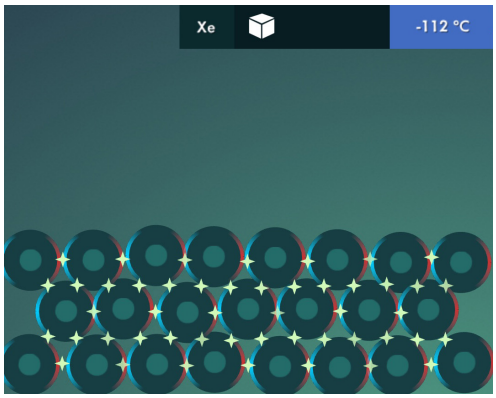
DIPOLE-DIPOLE

HYDROGEN BOND

LESS ENERGY REQUIRED → MORE ENERGY REQUIRED

CHEMISTRY CONCEPT:
A substance with stronger intermolecular forces will require more energy (heat) to melt, boil, or sublime.

CHEMISTRY CONCEPT:
When energy (heat) is added, the temperature of the substance will increase if there is no phase change occurring.



Heat is added:
- Temperature increases (kinetic energy of particles increases)
- Phase does not change

CHEMISTRY CONNECTIONS

CHEMISTRY CONCEPT:
When energy (heat) is added during a phase change (melt, boil, sublime), the energy is used to break IMFs and does not change the temperature of the substance.

Heat is added:
- Temperature does not change
- Phase change occurs