Understanding NGSS Standards in Chemistry



- HS-PS1-2: Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.
- HS-PS1-4: Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends on the changes in total bond energy.

- HS-PS1-5: Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.

Vocabulary

- Valence Electrons — Electrons in the outermost shell that are involved in bonding
- Chemical Reaction — A process where substances change to form new substances
- Reactivity — How likely an element is to undergo a chemical reaction
- Activation Energy - Minimum amount of energy that must be available for reactants to produce a result in a chemical change.
- Intermolecular forces — forces between molecules (broken in boiling)
- Chemical change — rearrangement of atoms to form new substances

Understanding Chemical Reactions

Chemical Properties and Changes



Boiling - Physical Change & Energy Absorption

- Boiling is a physical change (no new substance formed)
- Requires energy input to overcome intermolecular forces
- Water molecules absorb heat → gain kinetic energy → change to vapor
- Energy is used to break intermolecular forces, not bonds
- Endothermic process (heat is absorbed)



Energy Changes in Reactions

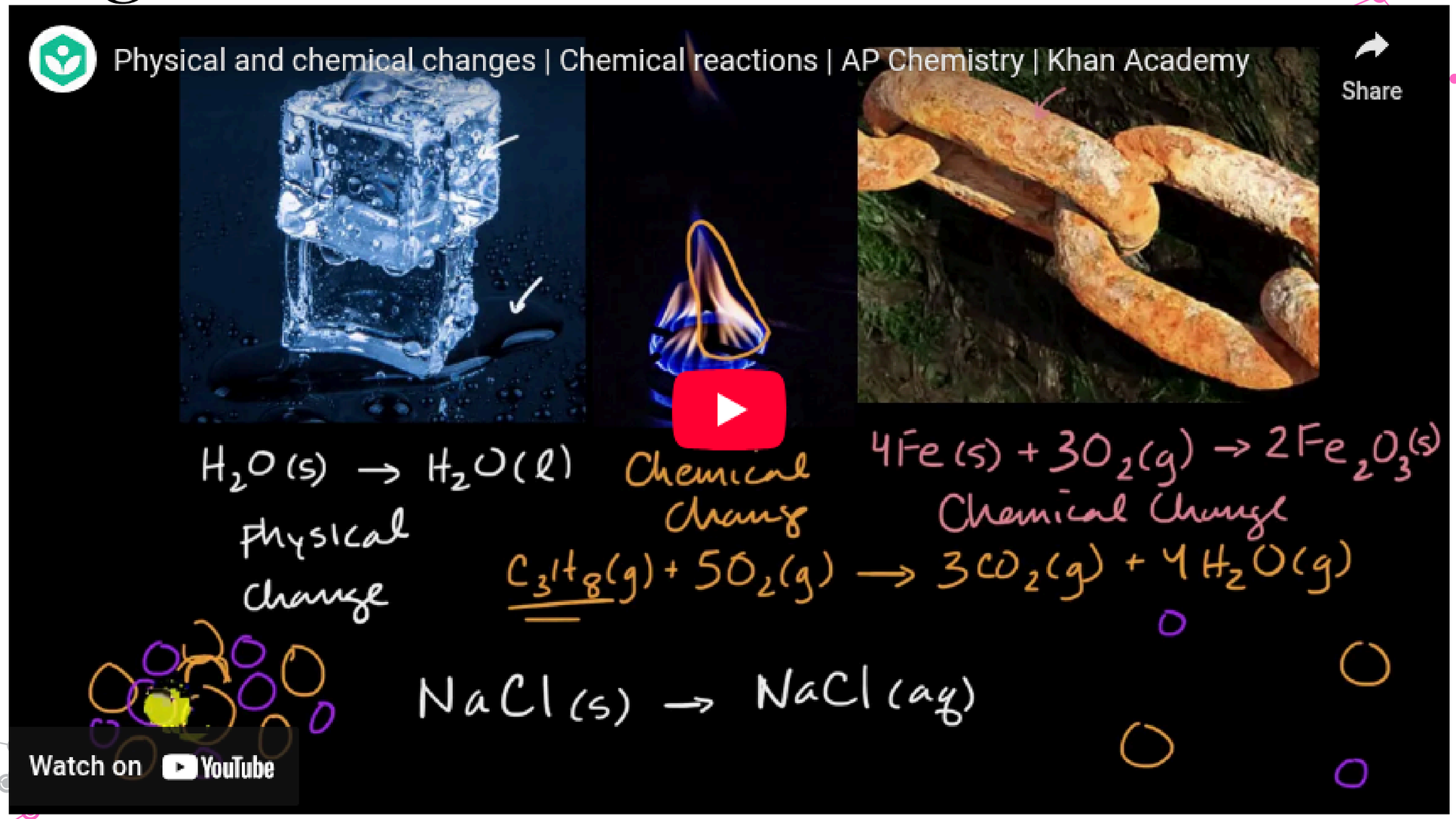
Understanding Chemical Reactions

How to Chemical Reactions Work

Double click on the simulation to try it out!



Physical and Chemical Changes



Energy Release Comparison

Caramelization

Involves **reactions** for sugar transformation.

Boiling

Requires **energy input** to change liquid to gas.

Temperature Effects

Higher temperatures **increase reaction rates** in both processes.

Process	Rate Factors	Notes
Boiling	Temp, pressure	Predictable, occurs at a set temp (100°C for water)
Caramelization	Temp, sugar type, concentration	Starts at ~160°C+, slower, depends on sugar breakdown and heat

Burning Questions

Lets Pause For Some Burning Questions!!!



Key Takeaways in Chemistry

Chemical Reactions

Understanding electron states helps predict outcomes.

Energy Changes

Modeling energy during reactions reveals important insights.

Reaction Rates

Temperature and concentration greatly influence reaction speed.

Caramelization Process

Heating onions transforms sugars, releasing rich flavors.

Boiling Onions

Boiling changes texture and enhances cooking efficiency.