



breaking a window



baking



rolling bread



crushing a soda can



frying an egg



melting ice



using batteries



exploding fireworks



burning fire



crashing cars



rusting chains



chopping wood

IT'S A MATTER OF  
**CHANGE**  
CLICK HERE

# Physical and Chemical Changes

- A ***physical change*** does not alter the composition or identity of a substance.

ice melting

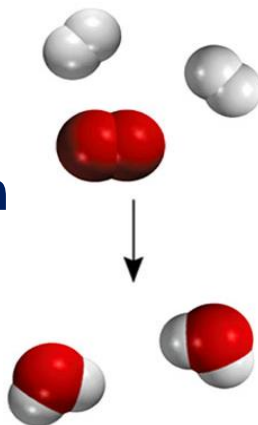


sugar dissolving  
in water



- A ***chemical change*** alters the composition or identity of the substance(s) involved.

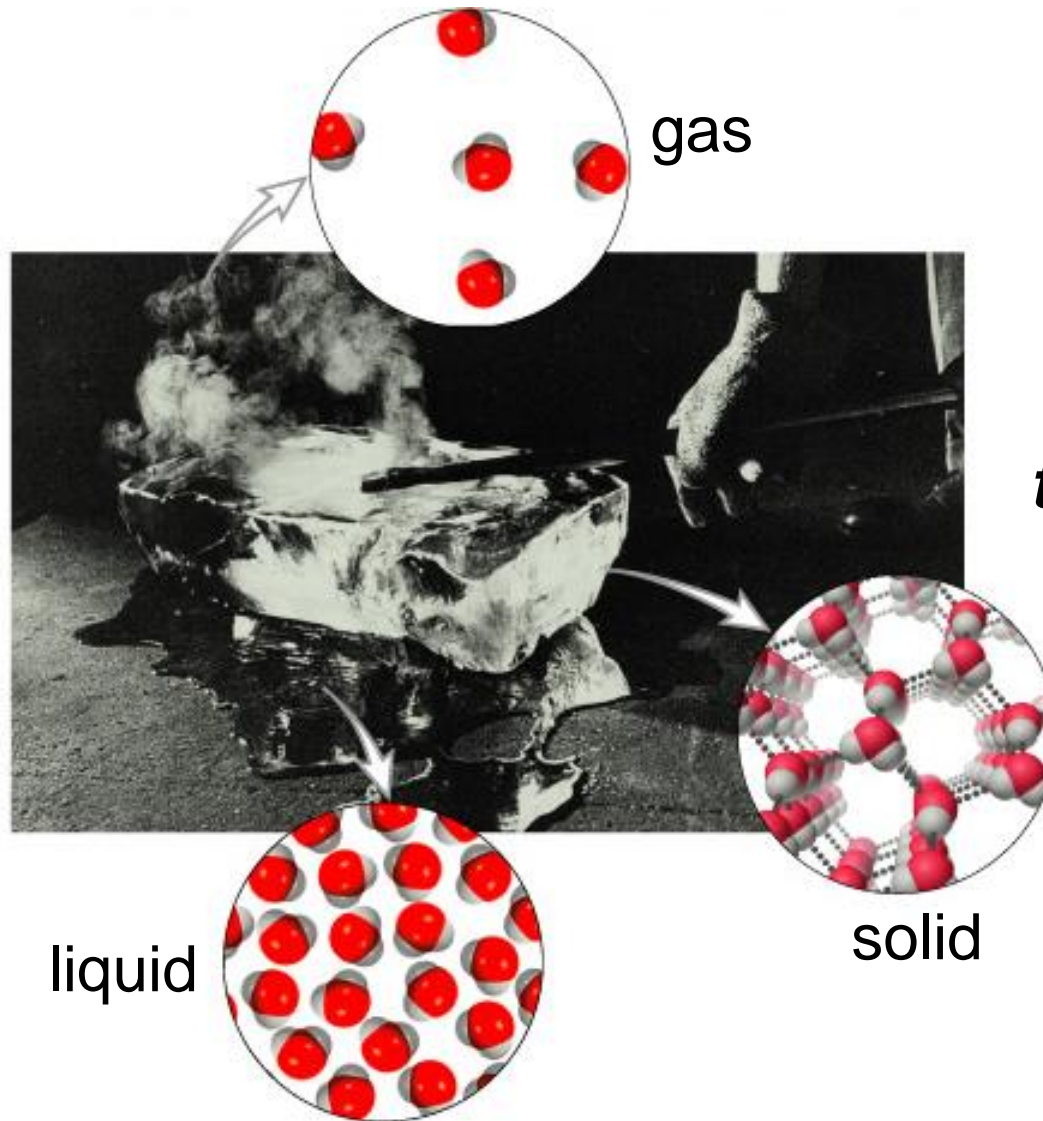
hydrogen burns in  
air to form water



# Physical Change:

## Effect of a Hot Poker on a Block of Ice

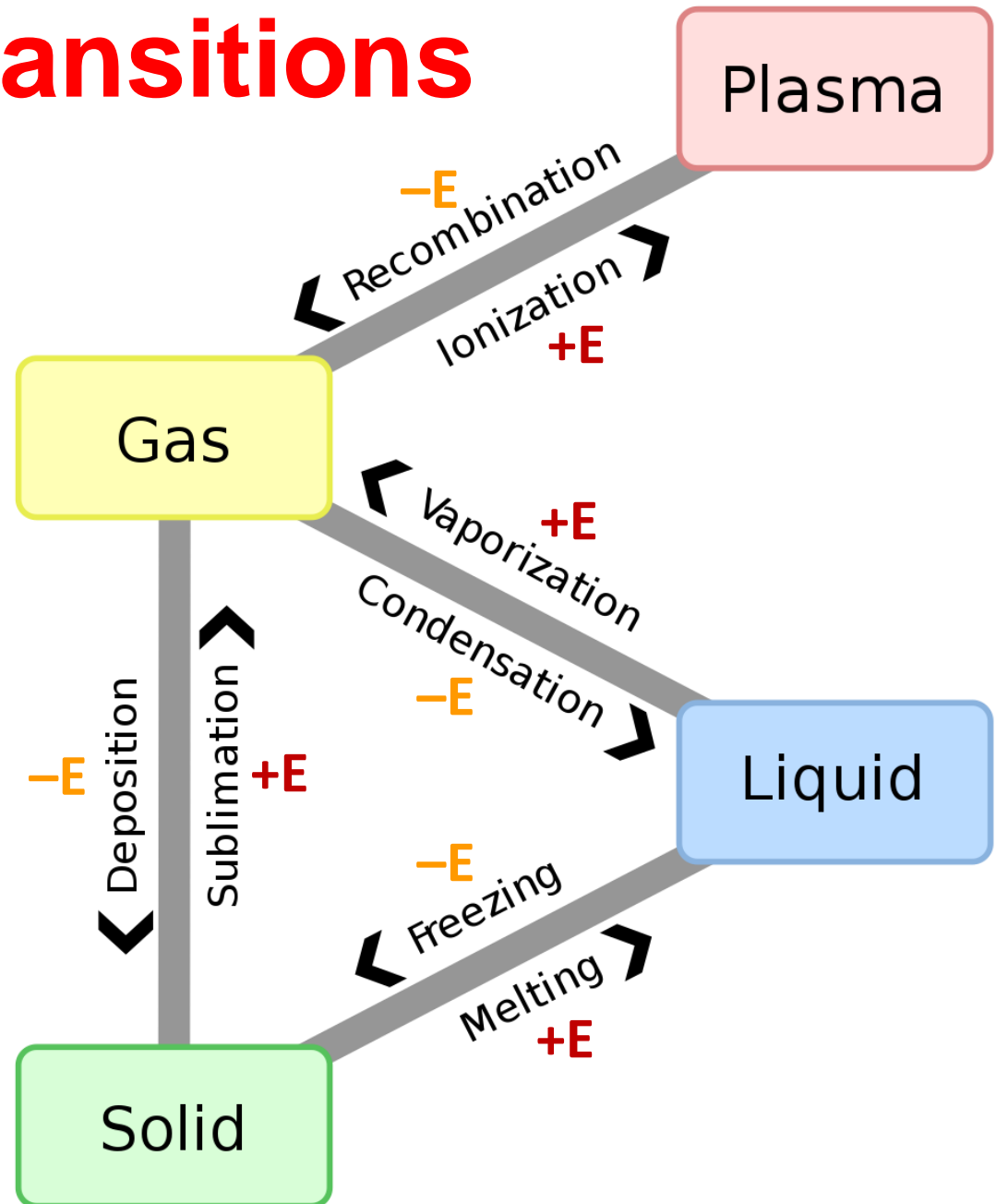
A change  
from one  
state of  
matter to  
another...



...is called  
a ***phase  
transition.***

# Phase Transitions

- A phase transition is the transformation from one phase or state of matter to another one by heat transfer.
- Heat can be absorbed (+E) or released (-E) by a substance as it changes structure.
- A phase transition can be recognized by an abrupt change in properties.





# Phase Transition Examples

**Dry Ice Sublimation**



**Freezing Lava**



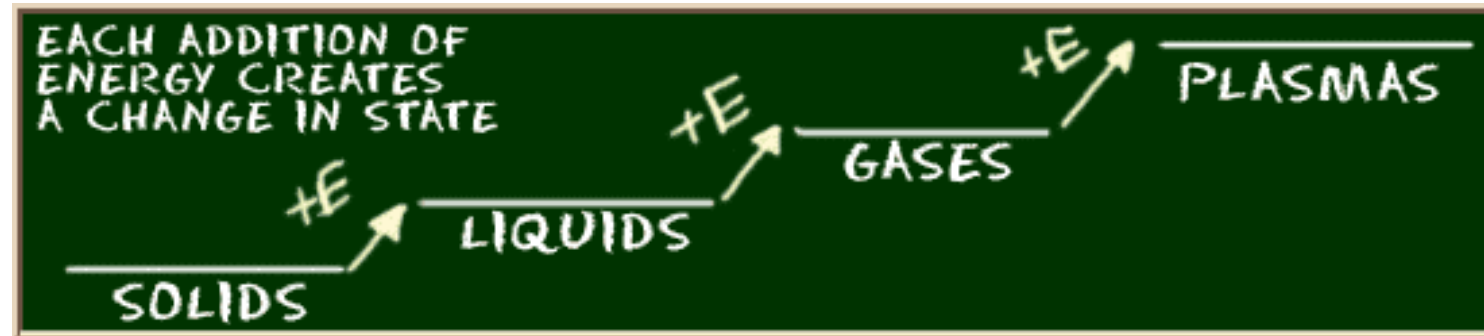
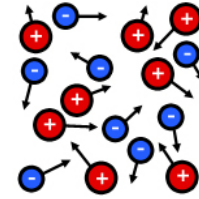
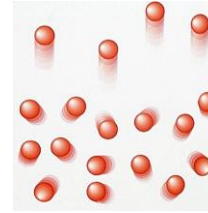
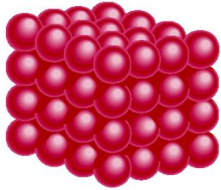
**Frost Deposition**



**Dew Condensation**



# States of Matter Summary



**SOLID**

Tightly packed, often in a regular pattern. Vibrate, but do not move from place to place.

**LIQUID**

Close together with no regular arrangement. Vibrate, move about, and slide past each other.

**GAS**

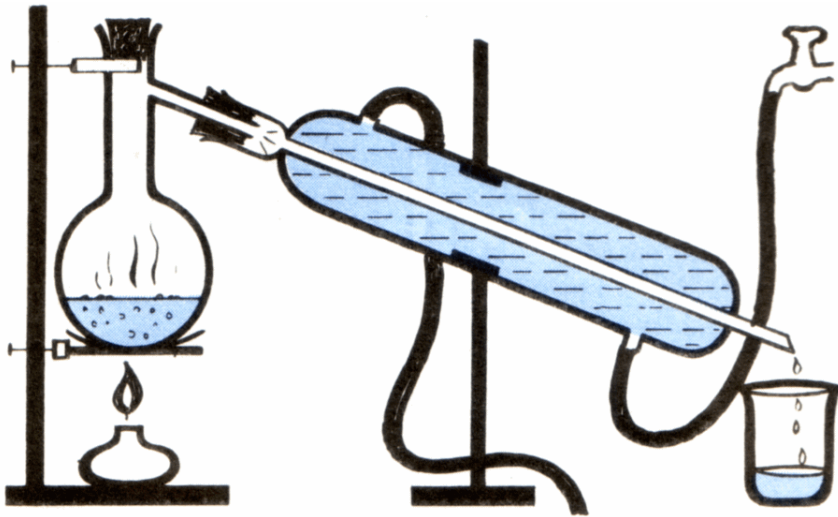
Well separated with no regular arrangement. Vibrate and move freely at high speeds.

**PLASMA**

Has no definite volume or shape and is composed of electrically charged particles.

# Mixtures: Physical Change

*Physical means (change)* can be used to separate a mixture into its pure components by exploiting their *different physical properties*.



To separate **sweet water** (water with sugar dissolved in it):  
boil the water,  
collect the vapor.

To separate **iron particles from sand** mixture: use a magnet.



What kind of mixtures are these?



# Chemical Change

A chemical change occurs when matter changes chemically into an **entirely different substance** with different properties.

- When vinegar (liquid) and baking soda (solid) combine, they form **carbon dioxide (gas)**.
- **Silver tarnishes.** The **solid silver** reacts with **sulfur in the air** to make **solid silver sulfide**, the black material we call *tarnish*.
- Chemical change is often **difficult or impossible to reverse**.



**Chemical means (change)** can be used to separate a compound into its pure components.



# Chemical Reactions

How do you know when a chemical reaction takes place?

**Color Change**



**Solid Formation**



**Odor**



**Temperature Change**



**Gas Formation**

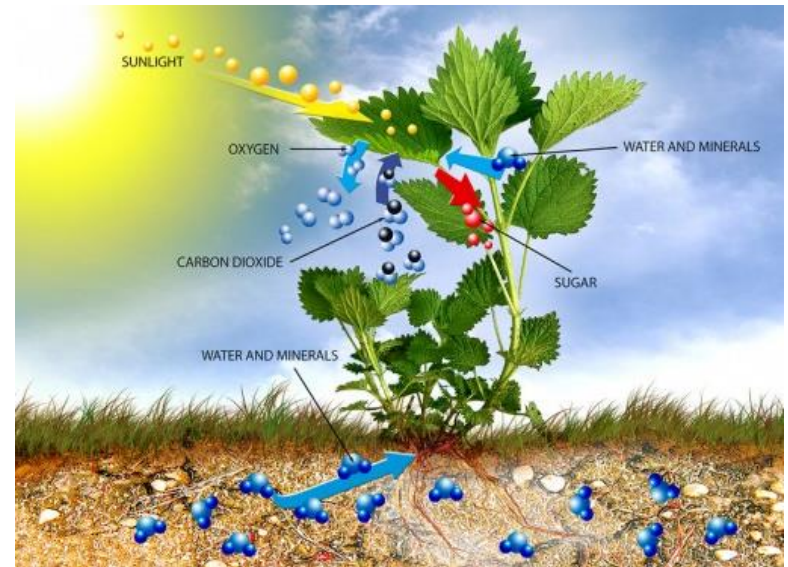


A chemical reaction can be recognized by a **change in properties** and, often, by an **appearance of a different state of matter**.

# Chemical Reaction Examples



**Combustion**: every time you strike a match, burn a candle, build a fire, or light a grill, you see the combustion reaction; it combines energetic molecules of fuel with oxygen to produce carbon dioxide and water.

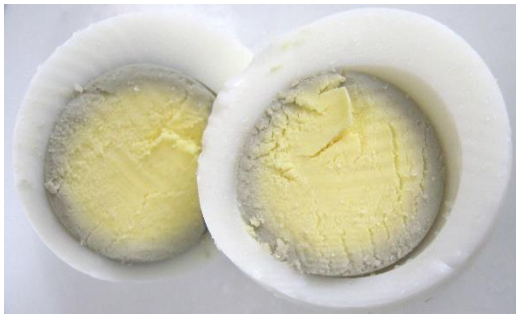


**Photosynthesis**: plants apply a chemical reaction called photosynthesis to convert carbon dioxide and water into food (glucose sugar) and oxygen.

# Chemical Reaction Examples

## Cleaning with soap:

soap emulsifies grime, which means **oily stains bind to the soap** so they can be lifted away with water.



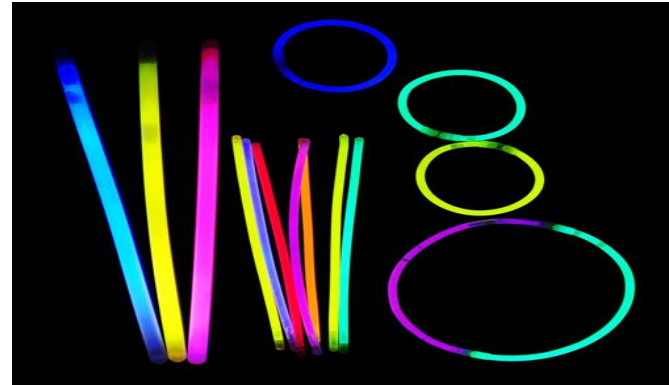
Boiling the egg: when you use **high heat** to boil an egg, it causes a chemical reaction between the yolk and the white that leaves a green film around the yolk. That film is iron sulfide, caused by **iron in the yolk reacting with hydrogen sulfide in the white** (it won't hurt you to eat it, and the egg will taste the same).



# Chemical Reaction Examples



**Rust:** over time, iron develops a red, flaky coating called rust, which is an example of an **oxidation reaction**.



**Glow stick** is a plastic tube with a glass vial inside. When you bend it, the glass vial breaks allowing the chemicals that were inside the glass to mix with the chemicals in the plastic tube. Once these substances combine, a **light-releasing reaction** starts taking place.