

# Lesson 13

Chemistry 0

Jan 2021, L. Tracey Gao



## Week 13 HW Review

- A wet 43.2 g sample of copper sulfate heptahydrate ( $\text{CuSO}_4 \cdot 7\text{H}_2\text{O}$ ) is heated until only copper sulfate ( $\text{CuSO}_4$ ) remains. The mass of the water lost is 34.1 g. What is the mass of the copper sulfate?
- A 13.5 g sample of calcium carbonate is heated until it decomposes completely to calcium oxide and carbon dioxide. After measurement, we learn that 7.6 g of calcium oxide is produced. What is the mass of carbon dioxide produced?



## Week 13 HW Review

A reaction occurs in a beaker between zinc metal and diluted hydrochloric acid to form zinc chloride and hydrogen gas according to the following balanced equation:



Why is there a decrease in the mass when you measure the leftover in the beaker?

- A. The reactants decompose.
- B. Zinc metal is a limiting reactant.
- C. Hydrogen gas escapes.
- D. Zinc metal precipitates.



## Week 13 HW Review

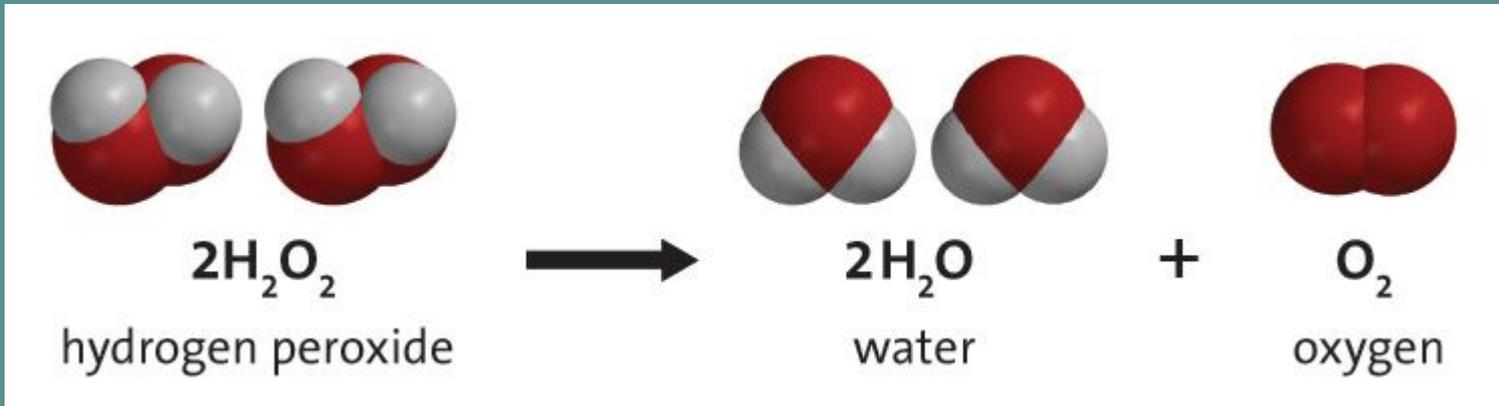
- What is the rate of reaction?
  - A. How fast a reaction is
  - B. How loud a reaction is
  - C. How big a reaction is
  - D. How much gas a reaction produces
- How can you set up an experiment to find out if the temperature of the reactants affects the speed of the reaction?



# Catalyst and Rate of the Reaction

- A catalyst is a substance that can help the reactants in a chemical reaction react with each other faster.
- A catalyst does not actually become part of the products of the reaction.

# Decomposition of Hydrogen Peroxide

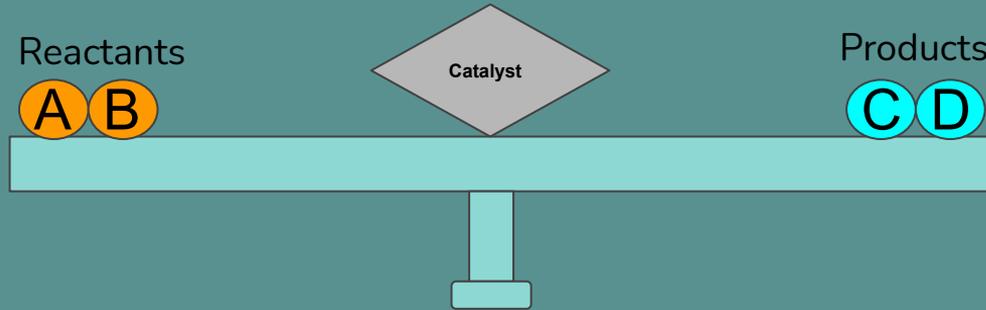


Potassium iodide was used to make the decomposition of hydrogen peroxide happen a lot faster. Even though the substance made the reaction go faster, the substance itself didn't change during the reaction. A substance that increases the rate of a reaction but does not become part of the products of the reaction is called a [CATALYST](#).

# What is a catalyst?

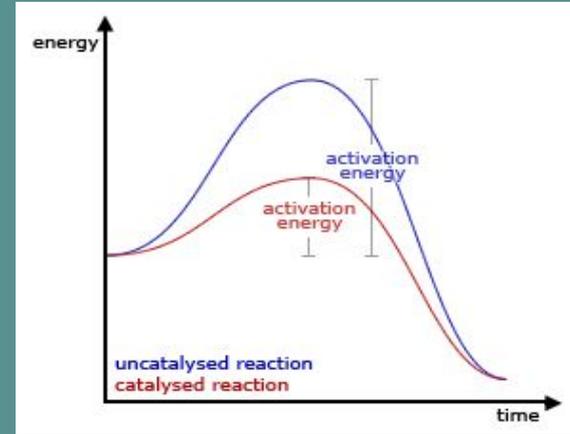
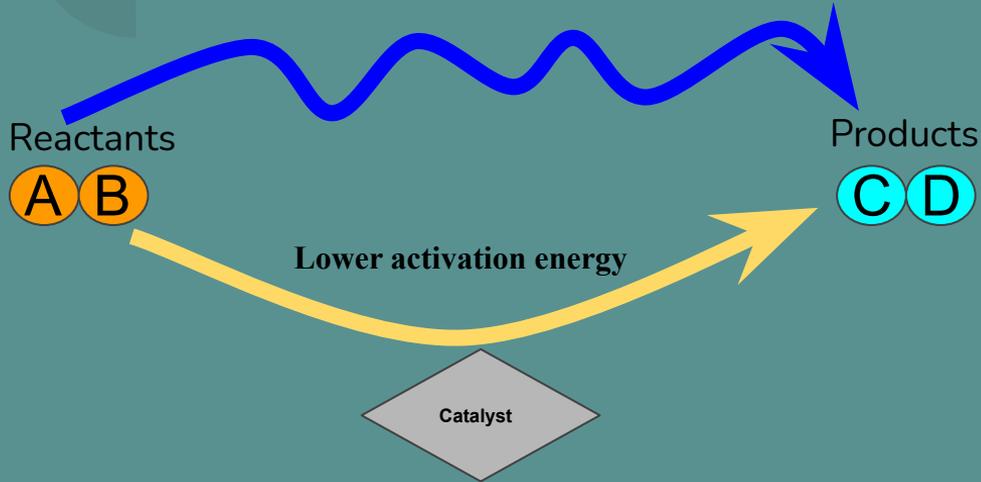


*Increases speed*



A catalyst is a substance that speeds up the rate of a chemical reaction but is not consumed during the course of the reaction. It does not become part of the products either.

# How does catalyst work?



A catalyst works by providing an alternative activation pathway for the reaction to occur. This pathway has a lower activation energy than the pathway without the catalyst.



## Some Common Catalysts

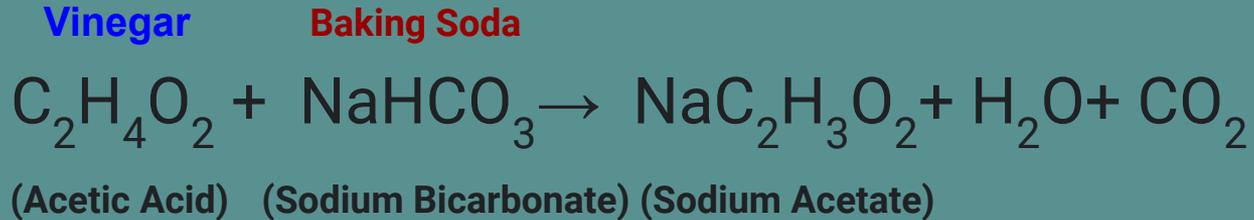
- Potassium Iodide: Decomposition of  $\text{H}_2\text{O}_2$
- Iron: Making Ammonia (Haber Process)
- Lactase: Lactase enzymes help the breakdown of lactose from milk and dairy products.
- Alkaline phosphatase (ALP): Breaking down proteins.



# Energy Changes in Chemical Reactions

- If two substances react and the temperature of the mixture decreases, the reaction is endothermic.
- If two substances react and the temperature of the mixture increases, the reaction is exothermic.

# Baking Soda reacts with Vinegar- Endothermic



- In this reaction, the temperature goes down so it is endothermic.
- In an endothermic reaction, more energy goes into breaking the bonds of the reactants than is released when the bonds in the products are formed.

# Magnesium reacts with Vinegar- Exothermic



- In this reaction, the temperature goes up so it is **exothermic**.
- In an exothermic reaction, more energy is released when bonds in the products are formed than is used to break the bonds in the reactants.



## Energy Changes in Chemical Reactions

- A chemical reaction involves the breaking of bonds in the reactants and the making of bonds in the products. It takes energy to break bonds and that energy is released when bonds are formed.
- Endothermic reactions absorb energy from the surroundings, whereas exothermic reactions release energy into the surroundings.



## Endothermic Reactions

- In an endothermic reaction, it takes more energy to break the bonds of the reactants than is released when the bonds in the products are formed. In an endothermic reaction, the temperature goes down.



## Exothermic Reactions

- In an exothermic reaction it takes less energy to break the bonds of the reactants than is released when the bonds in the products are formed. In an exothermic reaction, the temperature goes up.