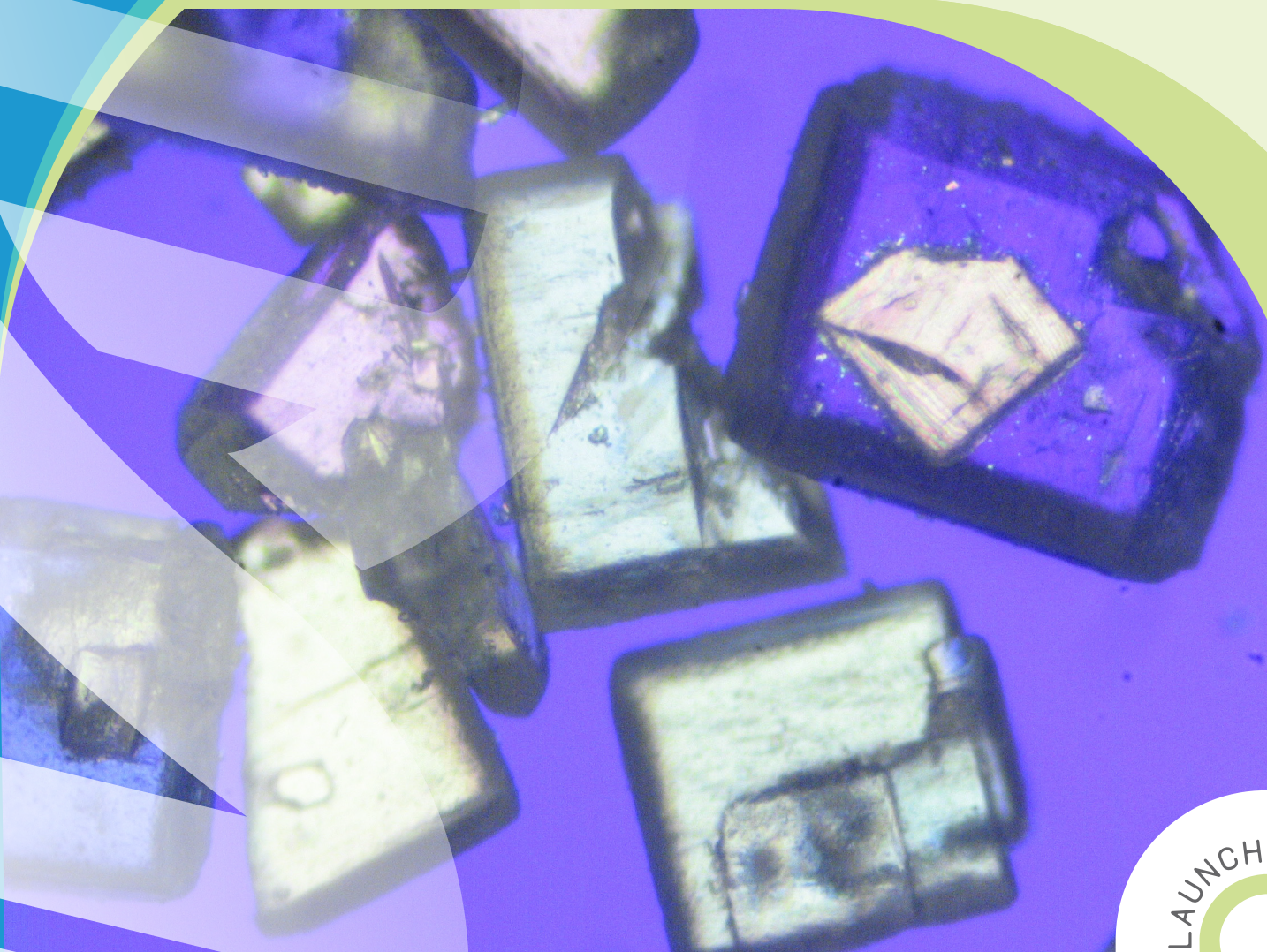


# RATE OF REACTION



STUDENT WORKBOOK

LAUNCH



**15.** Clean Cup A and Cup B (you can pour the liquids down the drain with plenty of water). You will use all the items and chemicals again in later activities, so don't throw them away.



## THINK ABOUT IT!

? 1. How did your prediction compare to your observations? Was the result expected or unexpected? Explain.

? 2. What do you think is happening in the cup for the color change to occur? Explain.

? 3. Why do you think the color change happened quickly instead of gradually?

? 4. What are some ways that you think might cause the time it takes for the color to change to be shorter or longer?

? 5. What are two questions you have about this experiment?

# ACTIVITY

## 2

# SET THE CLOCK

The reaction in Activity 1 happened in a specific amount of time. Why did it happen in that amount of time, and are there ways to change it? Do more experiments with the iodine clock reaction to see if you can change how fast it happens.

### LEARNING GOALS:

- ✓ I can use evidence to show how reaction rate is affected by changes in temperature and concentration of the reactants.
- ✓ I can explain how to make changes to the amounts of products or reactants to affect the amounts of products of a chemical reaction.

## REACTION TIME

2

### Getting a Reaction

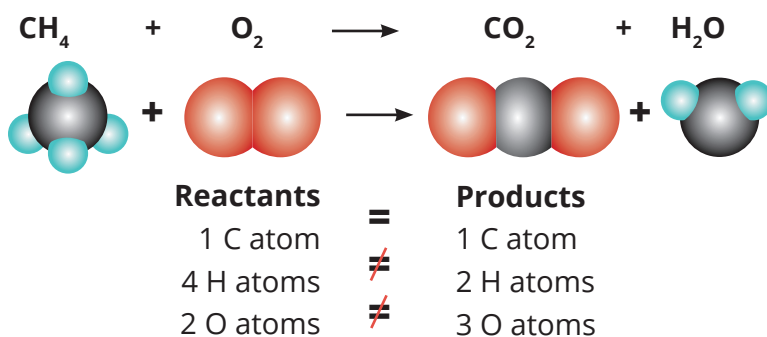
Before you learn about the time it takes for reactions to happen, let's make sure you have a solid understanding of what a chemical reaction is. A **chemical reaction** is a change in which two or more compounds interact to become one or more new substances.

**Reactants** are the compounds a reaction starts with, while the **products** are the compounds that are produced in a reaction. A chemical reaction is represented by a **chemical equation**, or a set of words or symbols showing the reactants on the left and products on the right. The arrow in a chemical equation is often called the "yields sign" and it means "results in," as in, the interaction between reactants results in the products.

### Examples of Chemical Equations

Equation Using Words	Equation Using Symbols
methane + oxygen → water + carbon dioxide	$\text{CH}_4(\text{g}) + \text{O}_2(\text{g}) \rightarrow \text{H}_2\text{O}(\text{g}) + \text{CO}_2(\text{g})$
aluminum + copper chloride → copper + aluminum chloride	$\text{Al}(\text{s}) + \text{CuCl}_2(\text{aq}) \rightarrow \text{Cu}(\text{s}) + \text{AlCl}_3(\text{aq})$
beryllium chloride + silver nitrate → beryllium nitrate + silver chloride	$\text{BeCl}_2(\text{aq}) + \text{AgNO}_3(\text{aq}) \rightarrow \text{Be}(\text{NO}_3)_2(\text{aq}) + \text{AgCl}(\text{s})$

When a chemical reaction occurs, the atoms of the reactants are rearranged in a new way to form the products. While all the atoms that were present in the reactants are also present in the products, they are grouped into different combinations.



## MATTER REVIEW

- Anything that has mass and volume is matter.
- The smallest unit of matter is the atom. There's one type of atom for each element of the periodic table.
- Atoms can be bonded together in groups called molecules.
- The three kinds of matter are elements, compounds, and mixtures.
- An element has only one kind of atom.
- A compound has two or more type of atoms, joined with chemical bonds.
- A mixture has two or more types of atoms that are only combined physically, not with chemical bonds.

In this experiment, you will vary the beginning concentration of ascorbic acid in the clock reaction and observe the effect on the rate of reaction.

## WHAT YOU NEED:

### FROM THE KIT:

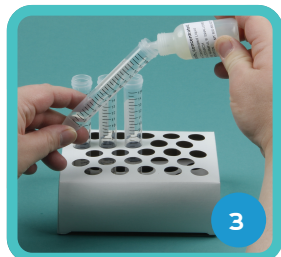
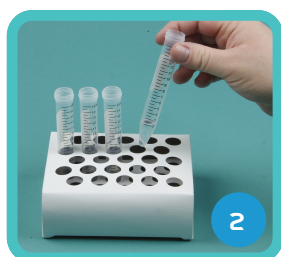
- 3 plastic graduated cups
- 5 test tubes
- Hydrogen peroxide
- Iodine (Lugol's) solution
- Liquid starch
- Pipet labeled for hydrogen peroxide
- Pipet labeled for iodine/Lugol's solution
- Pipet labeled for vitamin C/ascorbic acid solution
- Stir rod
- Test tube rack

### OTHER ITEMS:

- Apron (optional)
- Ascorbic acid (vitamin C) solution you made in Activity 1
- Stopwatch or digital stopwatch app
- Water

**WARNING! Contains hazardous chemicals.**  
Do not eat or drink. Wash your hands after use.

**WARNING! DO NOT EAT OR DRINK anything in this kit.**



## WHAT TO DO:

1. Place 4 of the test tubes in a row in the test tube rack. Make sure they are in the middle or are evenly spaced so the rack doesn't tip over.

**Note: The test tubes fit tightly in the rack. When you want to remove a test tube, hold the rack down around the test tube to avoid splashing.**

2. The test tubes are marked for every 1 mL from 2–15 mL. Add 2 mL of water to each of the 4 test tubes.
3. Add 1 mL of liquid starch to each of the 4 test tubes so that the total volume in each one is now 3 mL.
4. Use the correct pipet (the one you used for hydrogen peroxide in Activity 1) to add 4 mL of hydrogen peroxide to each of the 4 test tubes. The total volume in each tube should now be 7 mL.
5. Stir each test tube with the stir rod and then rinse the stir rod.





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Kit	SU-RATRXN
Instructions	IN-RATRXNS
Revision Date	8/2021