

Working with Catalysts

Student Worksheet

Name _____

Overview We're always in a hurry, and now our chemicals can join us as we speed our reaction up!

What to Learn You should understand that a catalyst is something that speeds up a chemical reaction.

Materials

- Goggles
- Gloves
- Measuring syringe
- Water
- Test tube rack
- 2 Test tubes
- Test tube holder
- Water bath
- One-hole rubber stopper
- 90 ° glass tubing
- Rubber tubing
- Alcohol burner
- Lighter
- Chemistry stand
- Zinc powder ([MSDS](#))
- Copper sulfate CuSO_4 ([MSDS](#))
- Sodium hydrogen sulfate NaHSO_4 ([MSDS](#)) **Sodium hydrogen sulfate is very toxic. Respect it, handle it carefully and responsibly. Do not take it for granted.**

NOTE: Be very careful when handling the sodium hydrogen sulfate – it's highly corrosive and dangerous when wet. Handle this chemical only with gloves.

Lab Time

1. Into Test Tube #1, place the following:
 - a. 2-3 spoonfulls of sodium hydrogen sulfate (NaHSO_4). Cap chemical when finished.
 - b. 5 milliliters of water
 - c. Spoon tip of zinc ($\frac{1}{2}$ of the small end)
2. Notice rate of bubble production.
3. Add spoontip of copper sulfate crystals to speed up gas production. Cap chemical when finished.
4. Put one-hole rubber stopper in test tube. Put 90° glass tubing into hole. Attach flexible tubing to glass tubing.
5. Immerse an empty test tube (Test Tube #2) into a water bath.
6. Put the end of the flexible tubing into Test Tube #2
7. Observe bubbles forming in Test Tube #2
8. To further speed up the reaction, heat Test Tube #1 using an alcohol burner.

9. When Test Tube #2 is completely full of gas, carefully pull out the rubber tubing, keeping the test tube inverted in the water bath so gas cannot escape.
10. If Test Tube #1 is hot from the alcohol burner, do not put it in a plastic test tube stand. Use a test tube clamp to hold it and put the clamp in the test tube stand.
11. Pull Test Tube #2 straight up and let excess water flow out. Bring it close to the flame and listen for a pop, indicating the presence of hydrogen.
12. This experiment can be done again and again as long as the chemicals are producing gas.

Working with Catalysts Data Table

Chemicals	Describe the chemical/chemical reactions you observe when additional materials are added
sodium hydrogen sulfate	
sodium hydrogen sulfate + water	
sodium hydrogen sulfate + water + zinc	
sodium hydrogen sulfate + water + zinc + copper sulfate	

Exercises Answer the questions below:

1. What did the copper sulfate do in this experiment?
2. What happened to the water that was originally in Test Tube #2 (in the water bath)?
3. Did hydrogen really get produced in this experiment? How do you know?
4. Why might a hydrogen fuel cell become very important to our environment?

Exercises

1. What did the copper sulfate do in this experiment? (It was a catalyst, meaning it sped up the reaction.)
2. What happened to the water that was originally in Test Tube #2 (in the water bath)? (It was displaced by the hydrogen gas.)
3. Did hydrogen really get produced in this experiment? How do you know? (Yes, because when the flame test was performed, there was a pop! This indicates the presence of hydrogen.)
4. Why might a hydrogen fuel cell become very important to our environment? (If scientists can make a hydrogen fuel cell practical, then our cars and other vehicles can be run on cheap, very clean fuel.)

Closure Before moving on, ask your students if they have any recommendations or unanswered questions that they can work out on their own. Brainstorming extension ideas is a great way to add more science studies to your class time.