

# Generating Oxygen

## Student Worksheet

Name \_\_\_\_\_

**Overview:** Potassium permanganate is a great little chemical with many uses. You're going to be amazed that you can use it to make oxygen!

**What to Learn:** After today, you will realize that  $\text{KMnO}_4$  can be heated to produce  $\text{O}_2$ , and that a glowing stick inserted into a test tube of  $\text{O}_2$  will glow to verify its presence.

### Materials

- Chemistry stand
- Plastic tub
- Water
- 2 test tubes
- Test tube clamp
- Potassium permanganate ( $\text{KMnO}_4$ ) ([MSDS](#))
- Alcohol burner
- Lighter
- One-hole rubber stopper
- 90° bend glass tube
- Measuring spoon
- Rubber tubing
- Match
- Wooden splint

### Lab Time

1. Fill the plastic tub about 2/3 full of water.
2. Insert a clean, dry test tube into the test tube clamp. Attach the clamp onto the holder on the chemistry stand. The test tube should be horizontal.
3. Put 4-5 spoonfuls of potassium permanganate,  $\text{KMnO}_4$ , into the test tube.
4. Gently twist the 1-hole stopper onto the small end of the 90° glass tube, and insert stopper into test tube.
5. Slide the rubber tubing onto the long end of the 90° glass tube.
6. Place the end of the rubber tubing into the plastic tub of water.
7. Take a clean test tube and place it in the water tub, filling it completely with water. Carefully place the end of the rubber tubing up inside the test tube. Keep the mouth of the test tube in the water, but allow the end to rest on the edge of the tub.
8. With adult help, light the alcohol burner and place it under the potassium permanganate,  $\text{KMnO}_4$ .
9. Observe the test tube in the water bath. When it is full of gas, take it out of the water bath by lifting it straight up and out of the water.
10. Using the alcohol burner, light a wooden splint, then extinguish it and place it in the test tube. What did you notice? Record your observations in the data table.
11. Extinguish the alcohol burner and allow glassware to cool before washing.

Disposal: Dispose of all solid waste in the garbage. Liquids can be washed down the drain with running water. Let the water run awhile to ensure that they have been diluted and sent downstream.

Cleanup: Clean everything thoroughly after you are finished with the lab. After cleaning with soap and water, rinse thoroughly. Chemists use the rule of “three” in cleaning glassware and tools. After washing, chemists rinse out all visible soap and then rinse three times more.

Storage: Place all chemicals, cleaned tools, and glassware in their respective storage places.

## Generating Oxygen Data Table

Item/Object	Observations
potassium permanganate, $\text{KMnO}_4$	
oxygen, $\text{O}_2$	
potassium manganate + manganese dioxide, $\text{K}_2\text{MnO}_4 + \text{MnO}_2$ (the solids left in the test tube after the reaction)	

**Exercises** Answer the questions below:

1. How do you know a gas was produced in this reaction?
2. What happened to the water that started off in the test tube?
3. If the gas produced in this reaction was carbon dioxide, what would happen when the glowing splint was placed inside? What gas was produced? How do you know?

## Exercises

1. How do you know a gas was produced in this reaction? (It bubbled into the test tube filled with water.)
2. What happened to the water that started off in the test tube? (It was displaced by the oxygen gas.)
3. If the gas produced in this reaction was carbon dioxide, what would happen when the glowing splint was placed inside? (Carbon dioxide would extinguish the flame, just like a fire extinguisher.)
4. What gas was produced? How do you know? (Oxygen, because it made the flame glow.)

**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.