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**PREPARATION OF OXYGEN: A DECOMPOSITION REACTION**

In this experiment, you will prepare & collect oxygen. A convenient laboratory method for preparing oxygen is to decompose hydrogen peroxide using potassium permanganate as a catalyst.

CAUTION: Oxygen is a strong oxidizer, making flammable substances burn readily. Potassium permanganate will stain clothing & skin. *Goggles must be worn at all times.*

**OBJECTIVES:**

* to prepare, collect, and describe some of the properties of oxygen
* to collect a gas using water displacement
* to initiate and observe a decomposition reaction

**MATERIALS:**

* Erlenmeyer flask
* pneumatic trough
* glass plate or rubber stoppers
* wooden splints
* ring stand
* gas collecting bottles (3)
* steel wool
* matches
* hydrogen peroxide (H2O2)
* rubber tubing
* thistle tube & rubber stopper
* clamp
* tongs
* Bunsen burner
* potassium permanganate solution (KMnO4)

**PROCEDURE:**

1. Assemble the gas-generating apparatus shown in Figure 1.
   1. Clamp a ring to the ring stand & place a wire gauze on the ring.
   2. Position an Erlenmeyer flask atop the wire gauze & clamp into place.
   3. Add approximately 50 ml of hydrogen peroxide to the flask.
   4. Cap the flask with the thistle tube/stopper assembly.
2. Fill a pneumatic trough approximately 3/4 full with water. Point the overflow spout of the trough into the sink.
3. Fill the gas collecting bottles with water, cover with glass plates, and set upright preparatory to use.
4. Slowly add potassium permanganate solution through the thistle tube until the reaction starts.
5. Invert one gas collecting bottle over the end of the rubber tubing and use water displacement to collect the gas.
6. When the bottle is full of gas, keep inverted and cover with a glass plate while the bottle mouth is still under water.
7. Remove the bottle and plate from the trough, return to an upright position, and set on the table.
8. In a similar fashion, collect two more bottles of gas.
9. Using the second bottle of oxygen collected, grasp one end of a wooden splint with the tongs. Ignite the other end of the splint. Blow out the burning splint & lower it into the upper 5.0 cm of the bottle. Observe.
10. Blow out the flame and reinsert into the bottle. Observe.
11. Blow out the splint and pour the remaining oxygen in the bottle over the glowing end of the splint. Observe.
12. Repeat steps 9-11 using the first bottle of oxygen collected. Observe.
13. To the last bottle of oxygen add 2.5 cm of water. Roll a piece of steel wool into a cylinder about 5 cm long & 0.5 cm thick. Hold one end of the cylinder in the tongs & stick the other end into a burner flame. Hold it there until it glows. Quickly thrust the glowing end into the last bottle of oxygen. Observe.
14. Disassemble the gas-generating apparatus.
    1. Remove the rubber stopper.
    2. Pour any remaining solution down the drain.
    3. Rinse the flask with water.
    4. Dry the apparatus & return it to your instructor.

**RESULTS:**

1. What evidence was there for a chemical reaction between the iron and the oxygen?
2. What test is used to determine the presence of oxygen?
3. Why was it possible to pour the oxygen over a glowing splint?
4. List some other properties of oxygen that you observed. .
5. Why did a splint that glows in air behave as it did in pure oxygen? Explain why the first bottle of gas did not react as intensely as the second bottle.
6. If the second product of hydrogen peroxide decomposition is water, write the balanced formula equation.

H2O2 →

1. Write the balanced formula equations for the reactions between oxygen and the two oxidation states of iron.

Fe(*s*) + O2(*g*) →

Fe(*s*) + O2(*g*) →