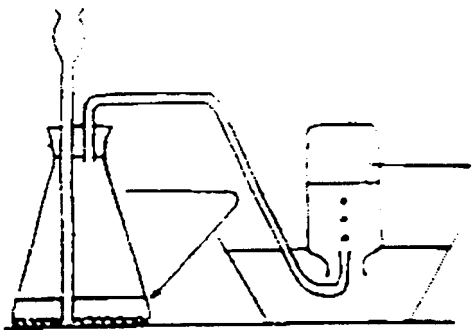
NAME _____ PREF ____ SECTION SC_____ DATE _____

## EXPERIMENT 5: NATURE OF BURNING

Equipment: glass plate, Bunsen burner, wood splints, funnel, bottles, trough, generator, deflagrating spoon
Materials: charcoal, 6% $H_2O_2$ $MnO_2$, 20mL $Ca(OH)_2$

In this experiment, oxygen will be prepared from a 6% solution of hydrogen peroxide, $H_2O_2$, using manganese dioxide, $MnO_2$, as a catalyst. **Set up the apparatus as shown in the diagram.**

A. Put enough manganese dioxide in a generating bottle to cover the bottom to a depth of 1/4-1/2 inch. Add water to just cover the manganese dioxide and then add enough hydrogen peroxide solution to obtain a steady flow of oxygen. Make sure the solution level is higher than the bottom end of the thistle tube. (Why?). _____ Collect 3 bottles of gas by water displacement. Let the gas in the first bottle escape. (Why?). _____



1a. Write the equation for this reaction. _____

Was it exothermic or endothermic? _____ How did you know? _____

_____

1b. If the rate of oxygen gas production slows down, should you add $H_2O_2$ or $MnO_2$? _____

Explain. _____

B. Into an empty bottle (1), pour about 20 mL (about an inch) of a saturated solution of $Ca(OH)_2$ (limewater). Cover the bottle with a glass plate and shake the solution for about 10 seconds.

2a. Do you observe any change in the solution? _____

2b. What does this show? _____

C. Ignite a splint and let it burn in the bottle you used in B (1). Remove the splint, cover the bottle, and shake the solution again for ten seconds.

3. Describe any change in the solution. Note: this effect is used to test for the presence carbon dioxide gas. _____

D. Add 20 mL of saturated $Ca(OH)_2$ solution to one of the bottles (2) of oxygen gas you prepared. Let an ignited splint burn in the bottle for a few seconds, as before, cover, and shake.

4. Did the splint appear to burn the same way in air as in pure oxygen? _____

Describe your observation. _____

Why might there be a difference? _____

5. Compare the solutions in the bottles from Part D and Part C. _____

_____

6. What gas was the product of burning in each case? _____

How can you tell? _____

E. Put a few pieces of charcoal in a deflagrating spoon. USE FUME HOOD! Hold the spoon in the **HOTTEST** part of the Bunsen flame until the charcoal glows red. Lower the deflagrating spoon midway into the second bottle (3) of oxygen you prepared. When the reaction seems to have stopped, remove the spoon, add 20 mL of $Ca(OH)_2$ solution cover, shake, and observe.


Deflagrating spoon

7. What gas is produced when charcoal burns in oxygen? _____

8. Write an equation for this reaction. _____

F. **TEACHER DEMONSTRATIONS: THESE MUST BE DONE INSIDE THE FUME HOOD!** Ignite 1/4 of a deflagrating spoonful of sulfur by heating it in a Bunsen flame. Cautiously note the odor of the product by waving your hand over the burning sulfur toward your nose. Now lower the burning sulfur into a bottle of oxygen gas.

9. Compare the speed of burning of sulfur in air with that in oxygen. _____

10. Compare the odor of the product when sulfur burns in air with the odor of the product when it burns in oxygen. _____ What must the product be in each case? ___

**IN THE HOOD:** Repeat the above with a small sample of phosphorus.

11. **Burning metal:** Tare steel wool (at least 7g) in a 2L beaker on a triple beam balance.

What do you think will happen to the mass after burning? _____

What happens to the mass? _____

Explain why? _____

**SUMMARY QUESTIONS**

12. When a substance burns it combines chemically with the element _____ to form compounds known as _____. These reactions are always (exothermic, endothermic).

13. A substance burns _____ in oxygen than in air.

14. Our atmosphere is approximately 79% nitrogen. What part does this element play in burning?

_____

15. Draw and completely label a potential energy diagram for the reaction used to make oxygen gas. Be sure to show the effect of the catalyst.