

For the EDUCATIONAL REVIEW.]

NATURE-STUDY AND SCIENCE.

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Lessons on the Gases in the Air.**LESSON III.**

Hold the flame of a spirit-lamp close under the mouth of a wide-mouth bottle inverted over the flame. Notice the clear liquid which collects on the inside of the bottle; feel it and taste it.

Hold the bottle over the flame again as before for a minute or two. Cover its mouth tightly with the palm of your hand; turn the bottle up and quickly pour some lime water in. Still keeping the bottle tightly closed, shake the lime water vigorously through the gases in the bottle.

Fasten a loose ball of woollen cloth or yarn, as large as a small marble, in the end of a wire, and bend the wire into a shape resembling a capital U with one arm bent in the middle at a right angle, for a handle.

Soak the woollen ball in alcohol, and hold the wire with the base of the U resting on the bottom of a dish 2 or 3 inches deep, and nearly filled with lime-water. Ignite the alcohol, and quickly lower a wide-mouth bottle, mouth down, over the flame until its mouth rests on the bottom of the dish.

When the burning has ceased, pour in more lime-water around the mouth of the bottle and take the wire out without raising the mouth of the bottle above the surface of the lime-water. Push your hand in under the mouth of the bottle, raise the bottle out of the water, and shake the lime-water which rose into the bottle repeatedly through the gases still there, being careful not to admit any air from outside into the bottle. Now let an assistant plunge a lighted stick into the remaining gas. The stick should at once cease to burn.

Prepare again, in the same manner, some of the gas which extinguished the burning stick, and empty it upward under water into a bottle (full of water) so small that the gas will fill it. Shake lime-water through the gas; if the experiment has been properly performed, the lime-water will remain clear.

Discussion.—The course and the extent of the discussion on these experiments are indicated by the following questions:

What two substances are produced by burning alcohol in the air?

How are they produced?

What two simple substances, then, must alcohol contain?

(Chemists have found that alcohol also contains a proportion of a third element—oxygen).

When alcohol is burning in the air, what is the flame giving to the air?—and what is the flame taking from the air?

Why didn't the lime-water rise till it *filled* the bottle inverted in the dish?

What did the lime-water take from the gases in which it was shaken?

Show whether the gas in which the stick would not burn is carbonic acid gas. (Call it nitrogen).

Why is nitrogen liable to be mistaken for carbonic acid gas?

How may the two gases be readily distinguished?

Argue from these experiments that the atmosphere contains nitrogen. (Chemists have found that about four-fifths of the atmosphere is nitrogen).

If the two preceding questions have been carefully taught, the pupils will not have much difficulty in answering these questions orally, and in giving good reasons for their conclusions.

They should then be asked to write out the arguments in support of their answers to two or three of the questions.

Questions for May and June.

(Answers to some or all of these questions should be sent to the editor of this department not later than June 20th).

1. Write an account of what you have found out by observation during May and the first part of June about our native birds. Give places and dates when you can; and describe the *ways* of the birds as well as their plumage.

2. Make a drawing from the object, natural size, of the leaf of the elm, sugar maple, red maple, ash, fir and willow.

3. Draw from the object, natural size, a single fruit of the elm, red maple, buttercup and adder's tongue (dog-tooth violet).

4. What plants of the rose family have you noticed in bloom this year, up to date.

5. Explain why alcohol was burned in the air in the preceding lessons; and why the lime-water was shaken through the gas before the burning stick was held in it.

I find your REVIEW a great help for my work in school. I am particularly interested in the cardboard work page, and have this kind of work in my school every Friday afternoon. My pupils are interested in it.

F. E. H.