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The Air We Breathe

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THE AIR WE BREATHE

General Science

In addition to the simple experiments already suggested attention is called to others which will show the common constituents of the air. Reference has already been made to the presence of carbon dioxide in expired air. An easy way to generate carbon dioxide for experiments is as follows: Take small pieces of limestone chips or chips of marble in a convenient jar or wide mouthed bottle with a rubber stopper and a bent glass with a connecting delivery tube of rubber. Pour a little water over the marble and add a spoonful of hydrochloric acid (muriatic acid). Pass the delivery tube into a second jar and the gas will soon fill it. It is better to keep this jar covered with a piece of paper or cardboard and pass the delivery tube through a small opening in the paper. Test the presence of the CO_2 by thrusting in a burning match or splinter. If it goes out, it is probably due to the abundance of gas generated. To show that this gas is heavier than air pour it into a tumbler containing a short lighted candle. Immediately it will fall and surround the candle and quickly extinguish it. The gas will remain in the tumbler so that a lighted match will be extinguished when an attempt is made to relight the candle. This experiment also shows that CO_2 does not support combustion and suggests that the chemical fire extinguisher may easily be constructed on the same plan, —namely, to provide a heavy non-combustible gas to smother flames. When CO_2 accumulates in old mines or unused wells due to decaying vegetation, it is sometimes called "choke damp" and is dangerous to human life producing suffocation and death. Its presence may be detected by lowering a lighted candle or torch into the chamber. It has been estimated that if all the CO_2 in the atmosphere were to fall and remain on the surface of the earth, it would make a layer ten feet deep and all humans would be suffocated or drowned in this sea of gas. Fortunately, all gases diffuse and intermingle no matter what their density may be. This may be demonstrated very easily by taking a bottle or jar of CO_2 and inverting over it a second bottle of air. Allow the bottles to remain snugly together for a minute or two and then separate them, covering each with a convenient piece of glass or card board. If lime water is poured into each bottle and shaken, the presence of CO_2 in both bottles will be indicated by the chalky appearance. This explains why the CO_2 of the expired air in a room goes into every part of the room and does not go to the floor as we might expect.

To generate oxygen which with nitrogen, carbon dioxide, and water vapor form the mixture known as air, is not difficult and any teacher with a small amount of apparatus can make some very interesting demonstrations of these gases. For the preparation of oxygen, take a test tube and place in in a teaspoonful of potassium chlorate and one-third as much manganese dioxide. (These chemicals are easily obtained. Ask a chemistry teacher, or send to a dealer in school supplies.) Shake until mixed. Twist a wire around the top of the tube to make a holder or handle and heat the test tube gently over a flame. When a crackling sound occurs it is due to oxygen being given off. Test its presence in the tube by lowering a red hot splinter of smouldering wood. If it burst into flames, it is evidence of the presence of oxygen. 21% of the air is oxygen which is very active in supporting combustion. It is diluted with nitrogen which amounts to 78% of the air. Many uses of oxygen may be mentioned, such as its value as a purifying agents and its necessity for respiration and combustion. No wonder we speak of the "life-giving oxygen" .

To show the nitrogen in the air, take a glass fruit jar, a pan of watter, a flat cork or light wood and some red phosphorus. (In place of phosphorus, cut off the chemical ends of five or six matches.) Place the chemical upon the floating cork and ignite. Quickly place the inverted fruit jar over the cork and as the burning proceeds notice the white vapor which arises and also the amount of water which partial-

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A CORRECTION

In the December Science Bulletin in the article by Professor O. B. Read on "Exhibits As An Aid in Science Teaching", the J. T. Baker Chemical Co. was listed as having signified its willingness to supply exhibit material. Before we included a company in the list given, Professor Read wrote to the company asking permission to use their name. We thought from the replies received that all the companies listed had granted us their permission. However, we apparently misinterpreted the reply of the J. T. Baker Chemical Co., as we find upon further correspondence that they will not be able to supply this material, so their name should be removed from the list.

We wish to beg your pardon if we have caused you any inconvenience by this misunderstanding. It is, however, gratifying to us to know that our readers are making use of our suggestions.

SCIENCE READING

One of the purposes of science teaching in the high school should be to train the pupils to appreciate and to read intelligently and critically the articles of scientific interest that appear in the public press. There is much so-called science that is printed in newspapers that is so exaggerated and embellished to attract attention that it is distinctly unscientific. However, it is not necessary for an article to be uninteresting in order to be scientific. There should be available in every high school for reading some periodicals in which scientific subjects are presented accurately but in an interesting way. The following periodicals can be recommended: NATURE MAGAZINE, 1214 16th St., Washington, D. C.; THE SCIENCE NEWS LETTER, Science Service, Washington, D. C.; THE SCIENTIFIC AMERICAN, 24 West 40th St., New York City; THE NATIONAL GEOGRAPHIC MAGAZINE, Washington, D. C.

Encourage your pupils to read these periodicals and report interesting articles. Help them to distinguish what is accurate and what is false. If you can create in your pupils an appreciation of scientific literature, you will have given them something that will always be of value to them.

It is now time to commence to keep your bird records in order to follow the spring migration of birds. A bird calender kept in your laboratory will be very valuable and will create much interest in your biology classes.

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ly fills the jar. This is explained by the fact that 21% or about one-fifth of the air is oxygen and is used up in the burning, its place being taken by the water. The white vapor is a compound of phosphorus and oxygen called phosphorus pentoxide. After some minutes this vapor is dissolved in the water and disappears. The space above the water now represents the remaining ingredient of the air, nitrogen. It is a colorless inert gas and does not support combustion. With a lighted match or splinter in readiness, raise the jar and thrust in the burning splinter. The gas does not ignite and the flame is extinguished. Because nitrogen is inert it plays a useful part in diluting the active oxygen in the air. It is used in the modern electric light bulb because it does not burn, although in its presence, the incandescent metal filament of the lamp gives a wonderfully bright light.

Many other demonstrations showing the applications of compressed air and atmospheric pressure are easily devised but this list will serve as an introduction to an extended study of the air and its importance in daily life.

S. F. Hersey.