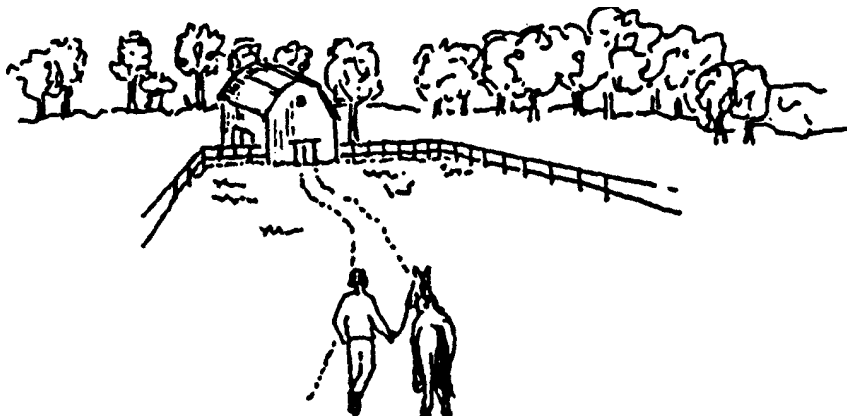


LESSON CLUSTER 3

The Air Around Us

Lesson 3.1: Is Air Nothing or Something

Air is all around us and all around the earth, but you can't see it. What is air?



Air is all around us

I asked one of my friends what would be left if you took all the furniture and rugs out of a room. She said “nothing.” What about the air? Is air nothing? You can't see it, but there is something there. Try some activities where you work with the “something” that is air.

Do Activity 3.1 in your Activity Book Now

When you hold a cup upside down under water, the cup does not fill up with water because air is really something. It is a gas that takes up space. Otherwise, we could easily fill up the cup with water.

When you sucked air out of the cup, did you notice that the level of water inside the cup went up? What happened when you blew air back in? You might have noticed that, this time, the water level went down. Air must be something, because it makes the water move up and down inside the cup.

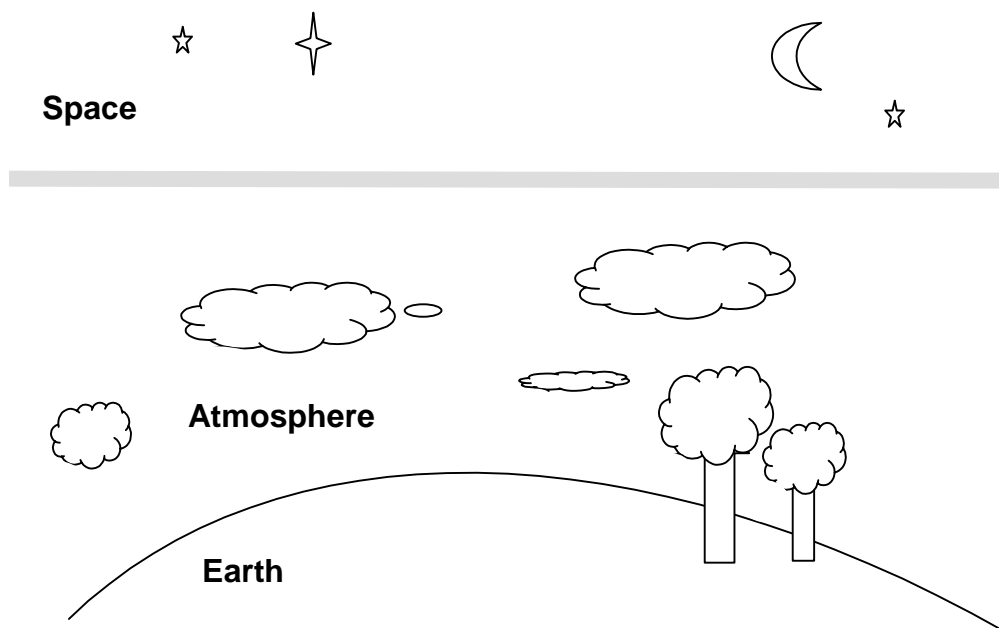
In this lesson you learned that air is something that takes up space. The next lesson will help you find out what that “something” is.

Lesson 3.2: What is Air Made of?

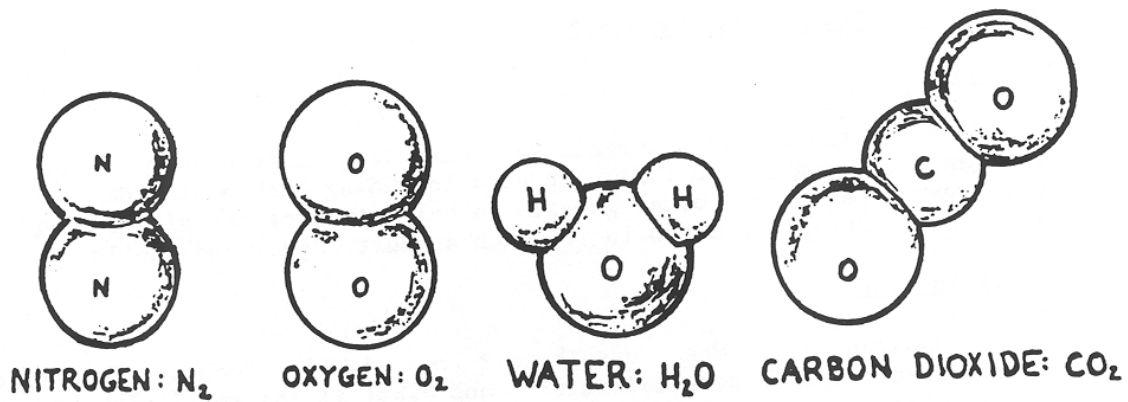
Air is not a liquid or a solid. Air is a gas. Like all gases, air is made of molecules that are far apart. That is why you cannot see air.

All the molecules of air are moving all the time, even when there is no breeze. The molecules never stop moving. They are far apart so they move freely, but they bump into each other and into other things, bouncing back and forth. Air is all around us, all the time. Even though you can't feel them, molecules of air are always hitting you. You breathe in molecules of air and breathe them back out.

The air that is all around the earth is called the atmosphere. The atmosphere goes up past the clouds, higher than mountains. As you go higher in the air, the molecules of air get farther and farther apart, and the air gets thinner and harder to breathe. If you keep going up, you finally get to space, where there are no air molecules at all.



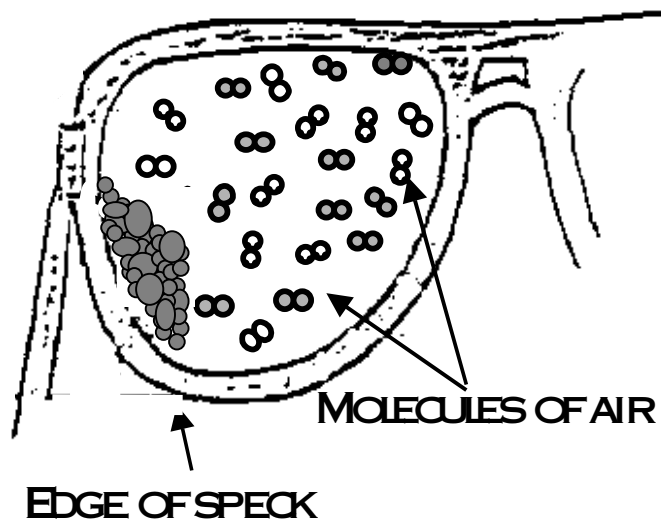
What are molecules of air like? First of all, let's imagine clean air without any germs, bacteria, dirt, dust, smoke, or pollution in it. Clean air is a mixture of different kinds of molecules, including nitrogen molecules (N_2), oxygen molecules (O_2), carbon dioxide molecules (CO_2), and water molecules (H_2O). These molecules "look" something like the pictures on the next page, though they are really too small to see.



Air is made mostly of nitrogen, oxygen, water, and carbon dioxide

How are these molecules alike and how are they different? All the nitrogen molecules are alike, but they are different from the oxygen molecules. All the oxygen molecules are alike, but they are different from water molecules. These molecules move freely and mix together to make air. AIR IS MADE OF THESE MOLECULES.

How big or small do you think these molecules of air are? Different molecules have different sizes. Oxygen molecules are slightly bigger than nitrogen molecules. Nitrogen molecules are slightly bigger than water molecules. But how does the size of any kind of a molecule compare with a very, very small object you can see with your eyes, like a speck of dust? Which is bigger, a molecule or a speck of dust? How much bigger? If we compare the size of a molecule and that of a speck of dust, it would look like the picture below:



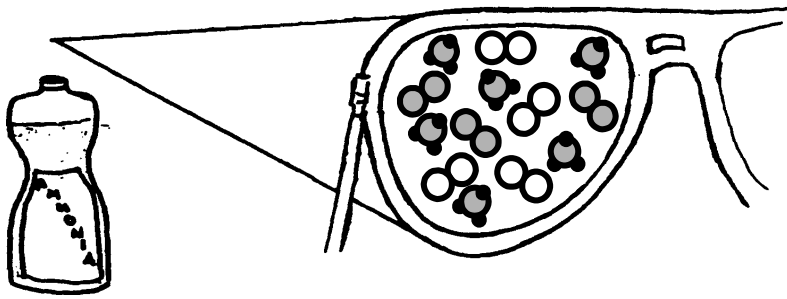
As you see in the picture, a speck of dust that you can barely see with your eyes is much, much, bigger than a molecule (trillions of times bigger!). The speck of dust is made of trillions of molecules itself; it is a solid while air is a gas.

If you look at the air molecules in the picture, you will see that they are mostly nitrogen and oxygen molecules. Air is about 4/5 nitrogen and 1/5 oxygen. Water, carbon dioxide, and other gases make up only two or three percent of the molecules in the air. Can you think of any substances other than dust that mix in air? There are many, including dirt, germs, bacteria, smoke, and many other substances. Most substances that you can see in the air, like dust or smoke, are made of solid particles that contain trillions of molecules each. But sometimes substances that you can't see also mix with air.

What else is sometimes in the air? Did you think of smell?

Do Question Set 3.2 in your Activity Book

What is the smell of perfume? First of all, smell is a gas and made of molecules. When a bottle of perfume is opened, some molecules of the perfume leave the bottle, go into the air, and mix in the air. These molecules of perfume in the air are constantly moving, so they spread out. They spread out until the perfume molecules reach and affect your nose. Then you can smell them.



You smell ammonia  **Ammonia molecule** molecules in it.

The same thing happens when you open a bottle of ammonia or you cut into a lemon. Molecules of the ammonia or lemon spread out in the air until they reach your nose. Ammonia, lemon, and perfume molecules are smelly because they affect your nose.

In this lesson you answered questions such as “What is air made of?”, “What are smells?”, and “How do smells travel?” In Lesson 3.3 you will study more about air and breathing.

Lesson 3.3 Air and Breathing

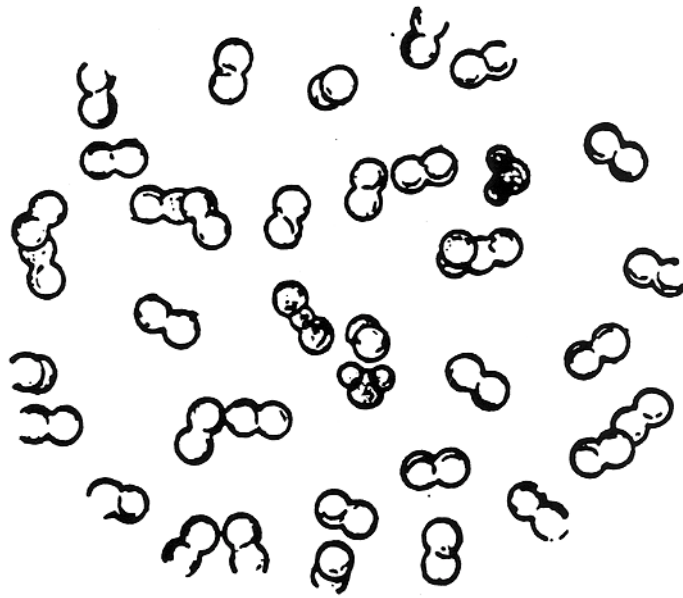
Has anyone ever told you that you breathe in oxygen and breathe out carbon dioxide? Well, that isn't really quite true. You breathe in air, which has oxygen molecules mixed in with molecules of nitrogen and other gases. What you breathe out is air, too, but the mixture of molecules is different! This lesson is about the changes that take place in air when you breathe it in and breathe it back out.

Do Activity 3.3 in your Activity Book

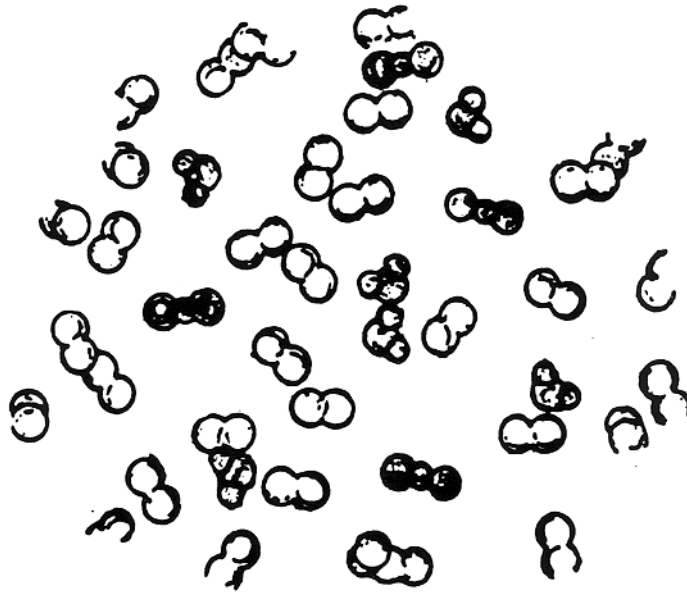
The air you breathe in is made mostly of nitrogen molecules, but your body has no use for them. You breathe them right back out. What your body needs from the air is the oxygen molecules that it contains. Oxygen molecules are used by your body; you get your energy by combining food and oxygen.

When your body uses food and oxygen, it produces two other substances, carbon dioxide and water vapor. How do you get rid of them? By putting them into the air that you breathe out!

The air that you breathe out, then, still contains the same kinds of molecules: nitrogen, oxygen, water, carbon dioxide, and a few others. The amounts of those substances, though, are different. The air that you breathe out has less oxygen, because some of it has been used by your body. It has more carbon dioxide and more water vapor, because these are produced by your body. The pictures on the next page illustrate these differences



Air breathed in



Air breathed out

this lesson cluster you studied what air is made of and how breathing effects the make-up of air. In the next lesson cluster you will learn how to compress and expand air.

Do Review Question Set 3.3 Now

