



If you go to your closet and take all your stuff out, is it really empty?

If you uncapped a bottle of soda and pour its contents in a glass, is the bottle really empty?

If you open a can of food and pour it into a bowl, is the can really empty?

The answer to all of these questions is “no”, because air is still inside the containers. As soon as you take the stuff out of your closet, pour your soda in a glass, or pour the food out of the can, air flows inside to fill the “empty” space.

If you don't believe it, ask an adult to help you try this...

1. Empty a small bottle of water or soda.
2. Turn the bottle upside down, so that the opening points down, and push it into a large bucket or sink filled with water.

3. Slowly flip the bottle right side up again while keeping it underwater.

What happened? Did you see bubbles? What was in the bubbles? Did the bottle stay empty?

When you turned the bottle right side up again, the air that was trapped inside the bottle escaped as bubbles. The water that was inside the bucket or sink flowed into the bottle until it was full. So the bottle was never really “empty”.

A space that is truly empty is called a vacuum. On Earth, we don't have any truly empty spaces, because air—or something else—is everywhere. But we can remove some of the air from a place temporarily. One way to do this is with a vacuum cleaner.

A compartment in the middle of a vacuum cleaner catches dust and dirt in a bag. A small hole for attaching a hose is at one end of the compartment, and a fan is at

the other. Most vacuum cleaners also have other parts, like beater brushes and nozzles, but inside they are all about the same. They have a dust compartment (which may have a bag in it), a hose (with a nozzle on the end), and a fan. See the illustration below.

When you turn on a vacuum cleaner, the fan inside starts to spin very quickly. The fan is positioned so that it pulls air out of the dust compartment and blows it out the back of the vacuum cleaner. As a result, air must rush through the hose at the other end to refill the dust canister. Because the fan blows the air out of the vacuum cleaner faster than the air can race through the hose to refill it, a “partial vacuum” occurs. The result is that the vacuum cleaner sucks air and dust through the hose, helping us clean our floors and carpets.

