

OBJECTIVE	Demonstrate the effect of the weight of air over our heads.
OVERVIEW	Since we do not normally "feel" air pressure, the student will see how the effect of the air pressure on two sheets of paper.
TOTAL TIME	2 minutes
SUPPLIES	Ruler, a sheet of printer paper, and a newspaper
PRINTED/AV MATERIAL	None
TEACHER PREPARATION	None

Background

We typically do not "feel" atmospheric air pressure. Why? Since air surrounds our bodies, and all things, the pressure, as a result of the air, is applied equally on all sides. For example, if someone holds an 8½x11" sheet of paper by their hand at arms length, the weight of the air directly above the sheet is over 1,300 pounds.

Obviously the paper does not weight that much. Why? That same pressure (14.7 pounds per square inch) is also pressing up on the bottom side of the paper. The equal pressure on all sides cancel each other out so all that is left is the weight of the material that comprises the paper.

Procedure

1. Lay a ruler on a table with about 3" (8 cm) hanging over the edge.
2. Lay a sheet of printer paper on the part of the ruler in direct contact with the table.
3. Press the paper against the table until it is flat as possible.
4. Press down on part of the ruler hanging over the edge.
5. Repeat the above steps except replace the printer paper with a large sheet of opened newspaper in the second step.

Discussion



The student will discover the newspaper was much harder to lift than the printer paper. As the ruler lifted the printer paper, air rush in under the rising paper and thereby quickly allowed the air pressure to equalize on all sides. Essentially, the weight of the air above the paper had no effect on the difficulty in lifting the paper.



As the ruler lifted the newspaper, the edges of the newspaper remained in contact with the desk. Very little air was allowed to rush in and equalize the pressure on the bottom side of the newspaper. Since there is less air below the paper the pressure is less as well. Now the weight of all the air above the paper now becomes more evident.

Fast Facts

We often speak of pressure in terms of atmospheres. One atmosphere is equal to the weight of the earth's atmosphere at sea level, about 14.7 pounds per square inch. If you are at sea level, each square inch of your surface is subjected to a force of 14.7 pounds.

In water, the pressure increases about one atmosphere (14.7 pounds per square inch) for every 33 feet (10 meters) of water depth. At the deepest part of all the earth's oceans, Marianas Trench's (east of the Philippine Islands) depth is about 35,800 feet (7 miles/11 km). The pressure of nearly 7 miles of water overhead is about 1080 atmospheres or 16,000 pound per square inch.

NOAA – National Weather Service