



Try This at Home Science

Vacuum Pack a Kid!

Activity Overview:

Observe the power of the air pressure all around us by vacuum packing a kid, or even your favorite action figure.

Materials:

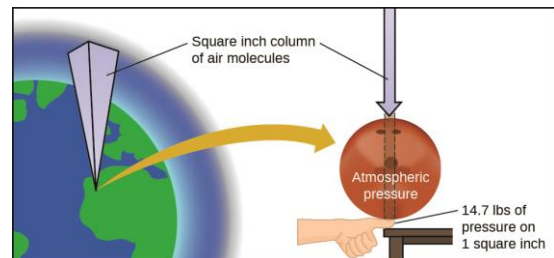
- Kitchen trash bag
- Volunteer, either a child or an adult who can easily kneel
- Soft surface, such as a rug or carpeted area
- Vacuum with hose attachment
- Functional outlet

Try this!

1. Gather materials in an area containing a carpeted floor or soft rug, and near a functional outlet for your power source.
2. Open the trash bag.
3. Have your volunteer step inside the trash bag, and kneel for safety.
4. Making sure not to cover the head of the volunteer, bring the trash bag as high on the body as possible and seal the bag by bunching it together. Ensure there are no large gaps where air may escape from the bag.
5. Take the hose of the vacuum and hand it to the volunteer inside the bag. Have the volunteer hold the nozzle of the hose in the following manner: grasp the hose with one hand and bring it close to their chest (or area near the top of the trash bag), cup the bottom of the nozzle with their other hand, making sure NOT to block the nozzle.
6. Gently pull the top of the bag as close to the volunteer's body as possible, while minimizing places air can escape.
7. Plug in the vacuum and turn it on. Observe!
8. Ask the volunteer to move, can they do it?
9. Turn off the vacuum. Ask the volunteer to move again, can they?
10. Release the volunteer and talk about your observations as you clean up.

What's happening?

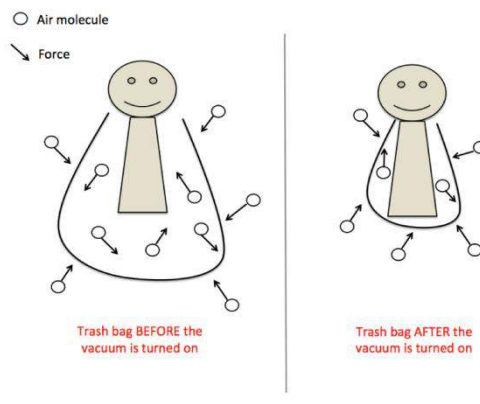
Right now, everything at sea level has 14.7 pounds per square inch of pressure pushing down on it from all of the air molecules above it. This means that all of the molecules from sea level up to the outermost layer of our atmosphere are stacked on one another like building blocks causing what is known as atmospheric pressure or ATM.



So why don't we *feel* this pressure? Simply, we are also made of molecules. Molecules are constantly pushing against each other with the aid of kinetic energy caused by charges within the molecules themselves. Also, gravity plays a role in the proximity of molecules in the atmosphere as closer to Earth there is a stronger gravitational pull increasing the number of molecules closer to the surface of the Earth than higher up in the atmosphere.

How does the vacuum impact the force felt by atmospheric pressure?

According to Newton's Laws, for every action there is an equal and opposite reaction. When the air molecules are removed from the trash bag with the vacuum, the resulting reaction is that the surrounding molecules outside of the bag are now able to push on the bag and since there are fewer molecules between our volunteer and the trash bag, our volunteer is now able to feel the force of the surrounding molecules pressing on the bag. This is why our volunteer cannot move, because the surrounding molecules have pushed the bag closer to our volunteer's body than it ever could have been without the vacuum resulting in a vacuum-packed volunteer!



Now try...

- Repeating this experiment with a stuffed animal and try to replicate the results. To prevent the nozzle of the vacuum becoming obstructed, tape a Dixie cup to the nozzle after cutting out a half dollar sized hole in the side and placing the hole towards the stuffed animal. Were your results the same as vacuum packing your volunteer? If not, why could this be?
- Repeat the experiment using an action figure, or another item from around your house. Were your results the same as vacuum packing your volunteer? If not, why could this be?

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