



DAY 12

A Tremendous Transfer of Force

Experiment 1: Pneumatics — Air Instead of Water

You will need

- Two syringes and the tube (from day 12)

Here's how

1. Empty the syringes and the tube of any water.
2. Take one of the empty syringes and pull the plunger all the way back. Slide the tubing onto the outlet of the syringe.
3. Take the other syringe, and push the plunger all the way down. Slide the other end of the tubing onto its outlet.
4. Now push the plunger of the first syringe down. What happens?



WHAT'S HAPPENING?

The plunger of the second syringe extends slightly, but not as far as syringe one was pushed in. This is because air, unlike water, can be compressed. But that doesn't mean that air cannot transmit power. This is called pneumatics — using the energy in compressed gas to make something move. Bicycle pumps and jackhammers are a few examples of pneumatic systems we encounter in everyday life.

Need help building your hydraulic system? [Watch this visual guide.](#)

Experiment 2: Objects can also transfer forces

You will need

- Two tennis balls or other types of balls



WHAT'S HAPPENING?

The kinetic energy — the energy an object has because of its motion — of the second ball is transferred to the first ball when it collides with it.

Here's how

1. Gently place one of the balls on the floor or a table so that it isn't rolling around.
2. Take the second ball and roll it so that it makes contact with the first, stationary ball. What do you observe?



A very cool example of this is called a Newton's cradle, which you may have seen clicking away on a grownup's desk. When you pull back and release one ball, potential energy turns into kinetic energy. When it crashes into the next ball, it passes most of its kinetic energy on. The second ball crashes into the third ball, passing most of its kinetic energy onto that ball, and the same happens between the third and fourth ball. When the fourth ball hits the fifth ball, the fifth ball swings outward. The potential energy you put into the ball was turned into kinetic energy, which was transferred from the first ball, all the way to the fifth ball. When it swings back, the same thing happens. This will go on for a while, but not forever. This is because, with every crash, friction turns some of the kinetic energy into heat energy, which gets released.