



LEVITATING PAPER CLIP EXPERIMENT

MATERIALS:

Legos Plastic Cups Magnets
 Paper Clips Plastic Ruler Lego Figurines
 Thread Clear Tape

VOCABULARY:

Magnet Positive Negative Repel
 Attract Poles Gravity Forces
 Mass Levitate

DIRECTIONS:

1. Make a bridge like the one in the photo using Legos or stacked cups and thin clear ruler.
2. If using Legos, tape a couple magnets to the bottom of the bridge portion. If using a ruler and cups, place the magnets on top of the ruler.
3. Cut a piece of string that is an inch shorter than the bridge. Tie one end to a paper clip. Tape the other end to the table directly under a magnet.
4. Hold the paper clip up near the magnet, but not touching the magnet or the ruler. Let go.
5. The paper clip should be suspended in the air.
6. Try the experiment again with the ruler version, but use mini Lego figurines. Tap a paper clip to their feet.
7. Hold them close to the ruler under the magnet and let go- they should stick to the ruler under the magnet.



STAR WARS SCIENCE

Defying Gravity



THE STEAM BEHIND THE EXPERIMENT:

There are two forces at work here: gravity and magnetism. Let's explore both separately first. Gravity is often associated with the Earth. However, anything that has mass has gravity. Gravity is a force that pulls object toward each other. The larger the mass, the larger the gravitational pull. Earth's gravity exists because Earth is so massive that we are all pulled down toward it. If you are on the moon, which has a much smaller mass than Earth, the gravitational pull is much less and that's why you almost feel weightless on the moon. Distance also impacts gravity. The farther apart two objects are, the weaker their gravitational pull is. Then there is magnetism, which is a force that can attract or repel magnetic objects.

When the paper clip is suspended in mid-air, the magnet is pulling it upward and gravity is pulling it downward. If you try this experiment without the string, you will quickly realize that the magnet is so strong that the paper clip will just be stuck to it if you get it too close. But if you place the paper clip too far from the magnet, it will simply fall. Now that we know why the paper clip can levitate, let's move on to why the paper clips can all of a sudden stick together. After all, paper clips are not naturally magnetic! Paper clips are made of steel and can be temporarily magnetized. This means the paper clips can only become a magnet for only a small time interval. In the presence of a strong magnetic field, the paper clip becomes a temporary magnet and attract other paper clips. That's why you can add a few paper clips to it before the entire paper clip chain gets too heavy and loses its fight with gravity. Also, it quickly loses its magnetism once the magnet is removed. For the paper clip to levitate, you have to get it in the sweet spot. What that means is that you need to find the place where the force pulling the paper clip up (magnetism) is about equal to gravity pulling it down.

MAKE IT AWESOME:

Try using different sizes of magnets or paper clips.

EXTENSIONS:

1. What happens when you change the size of the magnets or paper clips?
2. What happens when you use more than one paper clip?
3. What happens when you make the bridge taller?
4. What other changes can you come up with for this experiment?

WEBSITES AND VIDEOS:

1. Video: Floating Paper Clip: <https://sciencebob.com/make-a-paperclip-float/>
2. Video: https://youtu.be/ROj_LSzKDxE



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