

Magnets vs. Gravity

Estimated Time: 15-30 minutes

SUMMARY

Students will learn about magnetism and about its strength relative to another fundamental force that we feel all the time: gravity. Through experimenting, they can see how magnetism and gravity interact and better understand their world.

WHAT YOU'LL LEARN

- Magnetism is stronger than gravity but it's weakened over much shorter distances.

Materials Used	Resources Used
<ul style="list-style-type: none"> • Fridge magnets (1 or more) • Paper clips • Ruler 	<ul style="list-style-type: none"> • Fun with Magnets! Video

WHAT TO DO

1. The pull of a magnet, like any other force, has its limits. Looking at the fridge magnets, students should make estimates of how close the magnet must be to a paper clip before the paper clip “jumps up” to stick to the magnet. Once they have their estimates, list them all so that they can be compared later.
2. Put the paper clip on the table and put the magnet directly above it. Slowly move the magnet towards the paper clip until the paper clip “jumps” to meet the magnet. Freeze the magnet where it is when this happens.
3. Using the ruler, measure the distance from the tabletop to the magnet and record it next to the estimates above.
4. If you have multiple fridge magnets, try steps 1-3 with different sizes and types to see the range of magnets you have.
5. Stop to consider what the interactions are in this situation. What was stopping the paper clip from jumping up in the first place? There wasn't a hand holding it down or glue on the table, so what was holding the paper clip to the table?
 - a. The answer, of course, is gravity so then the question becomes why gravity couldn't hold the paper clip down as the magnet got closer. Gravity is stronger than magnetism to begin with but when the distance gets very small then magnetism wins!
6. To cement their ideas, have students draw diagrams or cartoons to explain how magnets attract metal things and when magnets are stronger than gravity, even the gravity of the whole Earth!

TIPS

- This activity has a lot of thinking and theorizing to it. This might be harder for younger children, in which case the [video](#) in the Resources Used section can be played between steps 4 and 5 to provide context and answers.
- The general idea of this activity is that magnets are stronger than gravity but that their strength doesn't extend as far as gravity's. Mathematically, we would say that gravity is "inversely related to the square of the distance" while magnetism is "inversely related to the cube of the distance." All this really means is that you divide the gravity force between two objects that are r distance apart by r^2 but you divide the magnetic force between them by r^3 .

This means that doubling the distance between two objects means that the gravity will be $(\frac{1}{2})^2 = \frac{1}{4}$ as strong as it was before, but the magnetic force will be $(\frac{1}{2})^3 = \frac{1}{8}$ as strong. When the distances get even bigger, so does the difference in strength between gravity and magnetism.