

Magnetic Tug of War!

Statement of the Problem

①

Between two magnets, which is stronger, a magnet's push or its pull? *I*

Ask a testable question.

③

Hypothesis

If two magnets are moved toward each other, then the PUSH PULL will be stronger because LIKE OPPOSITE poles ATTRACT REPEL each other.
(Circle your choices)

5th - must add because... (reason from B.I.)

*educated guess based upon research
Format - cause & effect relationship*

If the independent variable changes, then the dependent variable will change.

④

Materials

Two ring magnets
Centimeter ruler

- use metric

- list - be specific

③

Variables

Independent Variable: Push or Pull
Dependent Variable: Strength
Constants: Same measurement tool
Same size magnets
Same type of magnet
Same shape of magnet
Same surface time

*} obvious from question
} make the test fair*

3rd - optional; 4th - optional; 5th - required encouraged

④

Procedures

- recipe format; - begin with a verb commands

1. With flat side down, place one ring magnet at point A and one at point B. Move magnet B slowly until there is a pull.
2. Repeat the pull experiment for trials 2 & 3.
3. Turn magnet B over.
4. Repeat procedures 1 & 2 and record when there is a push.
5. Find the totals for the trials and average for the pulls and pushes. Compare.

⑤

Data

| Trial | Pull | Push |
|----------------|------|------|
| Trial 1 | | |
| Trial 2 | | |
| Trial 3 | | |
| Total | | |
| <u>Average</u> | | |

reduces the effect of an error or outlier.

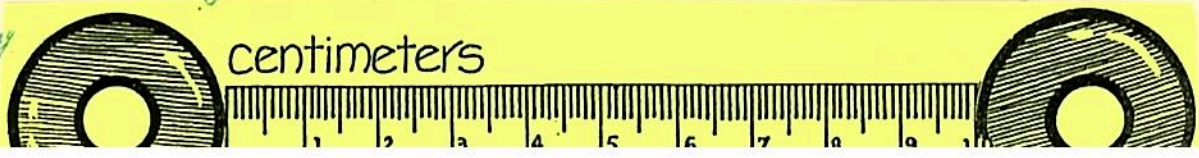
*- at least 3 trials for reliability & validity
- document trials with errors*

*Pictures - none of self
Discuss errors
Unexpected findings.*

Observations

format - your choice

Interesting findings



Do not

6

Conclusion

Analyze data, then draw a conclusion. Discuss results

It would appear that the magnets' PULL PUSH is stronger. (Claim) The amount of ATTRACTION REPULSION is stronger because of the placement of the north and south poles in relation to each other. Therefore, the hypothesis was SUPPORTED NOT SUPPORTED. (Support)

It would appear that... make a claim provide support
* address / restake hypothesis

Background Information

Magnets can be temporary or permanent. Alnico (an alloy of aluminum, nickel, iron, cobalt), makes excellent permanent magnets. Ferrites (ceramic like materials made of iron oxides with nickel and cobalt) also make excellent permanent magnets. The atoms inside are lined up in the same direction, making a magnet. All magnets have two poles where the magnetic fields are the strongest. They have a north-seeking pole and a south-seeking pole.

When two magnets are brought together, they will either attract or repel each other depending on the orientation of their poles. Like magnetic poles will repel each other, while opposite poles attract. This magnetic force acts at a distance as a push or a pull. Ring magnets have their poles on the top and bottom (flat) surfaces. This allows ring magnets to be stacked nicely if they are oriented with opposite poles next to each other.

3rd - 1/2 page
4th - 1 page
5th - 2 pages

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Recommendations

When conducting the experiment, be sure that the researcher performs the test on the same surface. Additionally, increasing the number of trials will increase the reliability of the experiment.

Another experiment idea is to see if the shape of the magnets makes a difference. The position of the magnets can be tested as well. For example, place the magnets on their sides as opposed to positioning them on their flat sides.

for the next scientist.
Things to include:
- additional constants
- additional trials
(increase reliability & validity)
- wonderings

2

Research the topic & give credit to the sources

8

Application

This experiment provides a great way to determine the best position of magnets in a roller coaster. Magnetic power is often used to start and stop a roller coaster.

By determining the stronger of the push or pull of magnets, roller coaster designers can easily determine which placement of the magnets, like poles facing or opposites facing, would be the best for the take off position and the stop position.

How does this project fit in the real world?
What is its value to the real world?

Bibliography

"All About Magnetism and How It Works - Easy Science For Kids." *Easy Science For Kids*. N.p., n.d. Web. 23 Sept. 2014. <<http://easyscienceforkids.com/all-about-magnetism/>>.

"Fun Magnet Facts for Kids - Magnetic Information about Magnetism." *Fun Facts for Kids - Magnetic Information about Magnetism*. N.p., n.d. Web. 23 Sept. 2014. <<http://www.sciencekids.co.nz/sciencefacts/magnets.html>>.

"Magnets." Ask Earl. Yahoo!igans.yahoo.com/content/ask_earl/page?d=20070714.

"Magnets." Canada Science and Technology Museum. <http://www.sciencetech.technomuses.ca/english/schoolzone/Info_magnets/> July 2014.

Winkleman, G., ed. *Mostly Magnets*. "Magnetic Tug of War," AIMS Education Foundation, 1991.

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3rd - 3 resources

4th - 3-5 resources

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Acknowledgements

This scientist would like to thank the scientist's parents for providing the materials and supporting

I, me, etc

Do not put the
student's name on
the report.

Attach
the typed
Research
Paper
to either flap.

Student's First & Last Name

Teacher's Name