**Your Goal**: is to investigate the variety of ways in which different objects or materials interact with magnets, using a very strong "super magnet" and then an ordinary bar magnet.

- Obtain a super magnet from your teacher and do all of Parts 1, 2 and 3.
- **Return the super magnet** to your teacher and get an ordinary bar magnet.
- Repeat all of the investigations using the bar magnet.

## Part 1: What common objects might be magnetic?

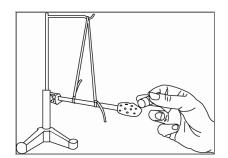
## Caution! The super magnet is also very powerful! Hold on to it at all times. Do not set it down.

Investigate how each of the following objects is affected by each end of the magnet. Clearly describe the interactions that occur (weakly attracted, strongly repelled, no interaction, etc.).

	With super magnet	With bar magnet
Paper clips		
Nails		
T		
Nickel		
Wood stick		
Plastic ruler		
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Paper money		
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#### Part 2: Could a pickle be magnetic?

Make a V-shaped harness of string for the stick so that you can hang it from a support and it will move freely. Put a grape (or half a pickle) on each end of a wooden stick. Make sure the apparatus is **perfectly still** before your test. Bring the magnet toward and away from the pickle several times. **Get as close as you can without touching the grape**. Try each side or end of the magnet. Record your findings.



	With super magnet	With bar magnet
Grapes/pickle		

## Part 3: Are there different kinds of magnetism?

Hang each of the following objects on a string. When the object is *perfectly still*, move the magnet *toward and away* from the object several times, again getting as close as you can without touching. Try each side or end of the magnet. Describe what you observe.

	With super magnet	With bar magnet
Copper tubing		
Aluminum can		
Graphite (carbon)		

Now, return the super magnet to your teacher and repeat Parts 1, 2 and 3 using an ordinary barshaped magnet. Again, try each end or side of the magnet to see if it makes a difference.

# Experiments in Magnetism Across Scale

#### Summary

1. With other members of your lab group, decide how you would divide these objects or materials into categories, based on their interactions with both magnets. List the categories and the items you would put into each category below. Make up a name for each category. How many categories do you need to describe all of the possibilities? We will discuss our results as a class.

2. Write one or more questions you have today about magnetism.

#### Follow-up (optional

Using the back side of the page, make a drawing or picture of your own design that a classmate could use to classify a material as diamagnetic, paramagnetic, ferromagnetic or not magnetic based on the evidence that you obtained in your investigations and discussion.

For more lessons and programs from Purdue Physics and Astronomy, check out **Saturday Morning Astrophysics at Purdue** on YouTube, <u>https://bit.ly/3dgBSG4</u>