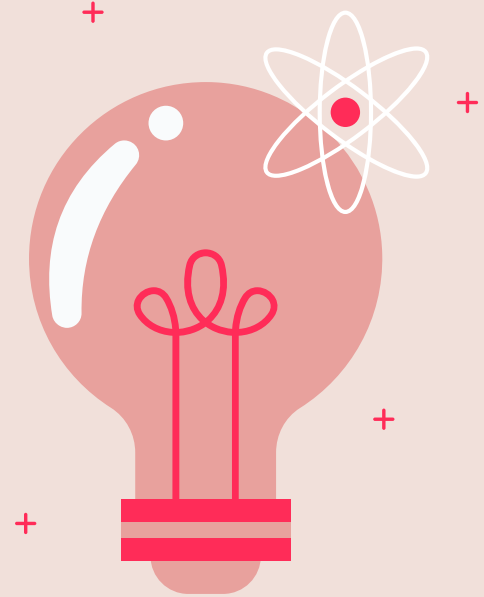


HOMOPOLAR MOTOR

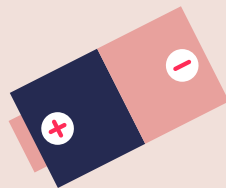
PRESENTATION

Ashley Magana & Norma De la Rosa
Physics 135B





**LET'S LEARN
SOMETHING!**



01

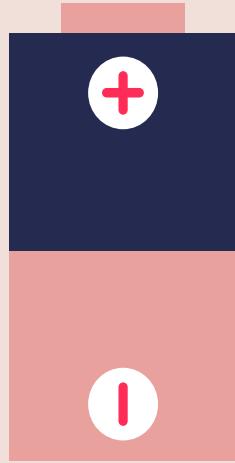
**LEARNING THE
BASICS: WHAT IS
A HOMOPOLAR
MOTOR?**



A homopolar motor is a type of electric motor, specifically it is one that uses direct current to power rotational movement, such as that generated by a battery. It was the first type ever built and demonstrated by Michael Faraday in 1821. Although not the configuration Faraday used, homopolar motors can be made out of a single AA or C battery, a single neodymium disc magnet and a piece of copper wire.

They have two magnetic poles provided by the single permanent magnet that is used to produce the magnetic field, also required to generate rotational movement. It is called a homopolar motor because, unlike conventional DC motors, the polarity of the magnetic field emitted by the conductor and the permanent magnets does not change.





02

**MATERIALS
& STEPS**

01



ONE AA BATTERY

Provides the current

02



COPPER WIRE

Or any type of conducting
wire that will allow the
current to move

03

MAGNET

Source of magnetic field

04



SCISSORS

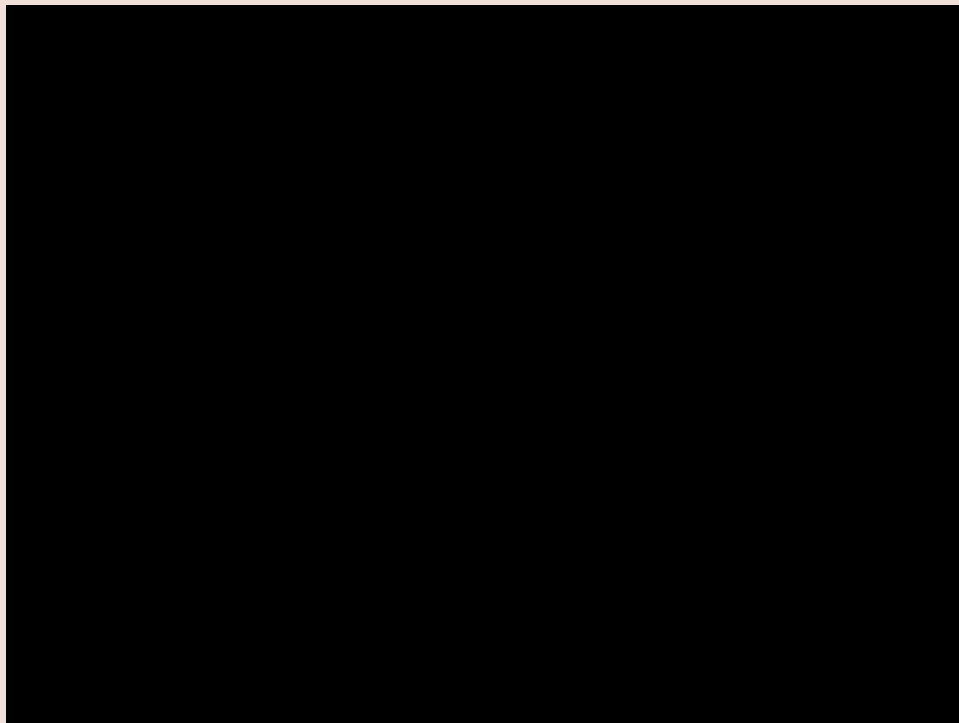
To cut and help mold the
wire

MATERIALS

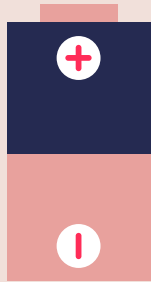




MATERIALS



STEPS FOR BUILDING A HOMOPOLAR MOTOR



01

Cut and bend the copper wire into as many shapes as you would like.

02

Place the neodymium magnet on the negative side of the battery.



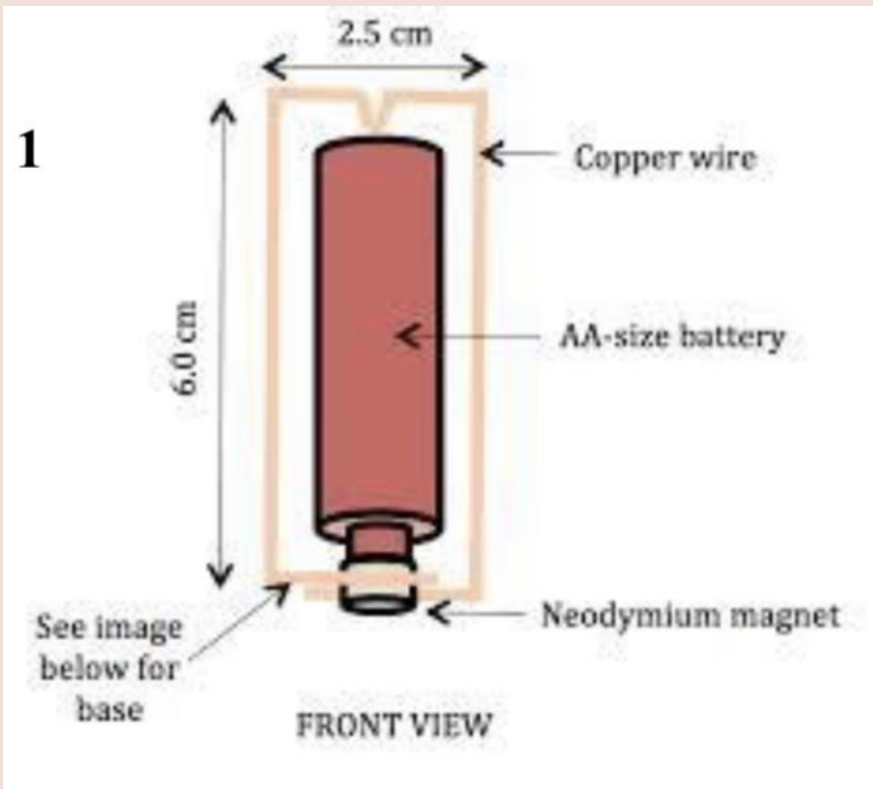
03

Set the copper wire shape on the battery and wait for it to start spinning.



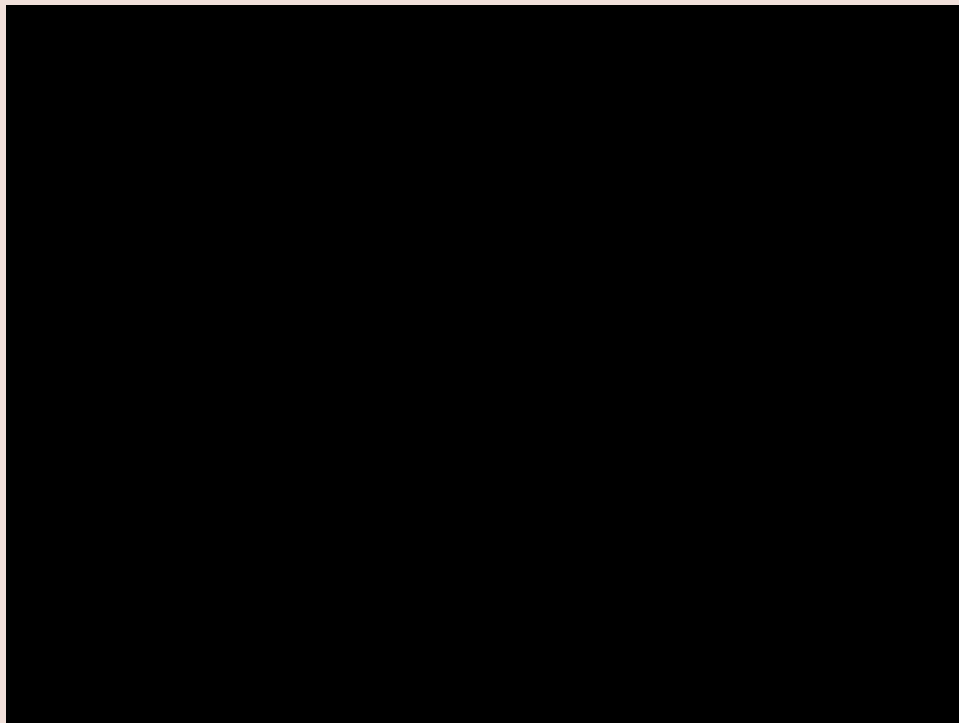
VOILÀ !

You have made a homopolar motor.





FINAL PRODUCT





03

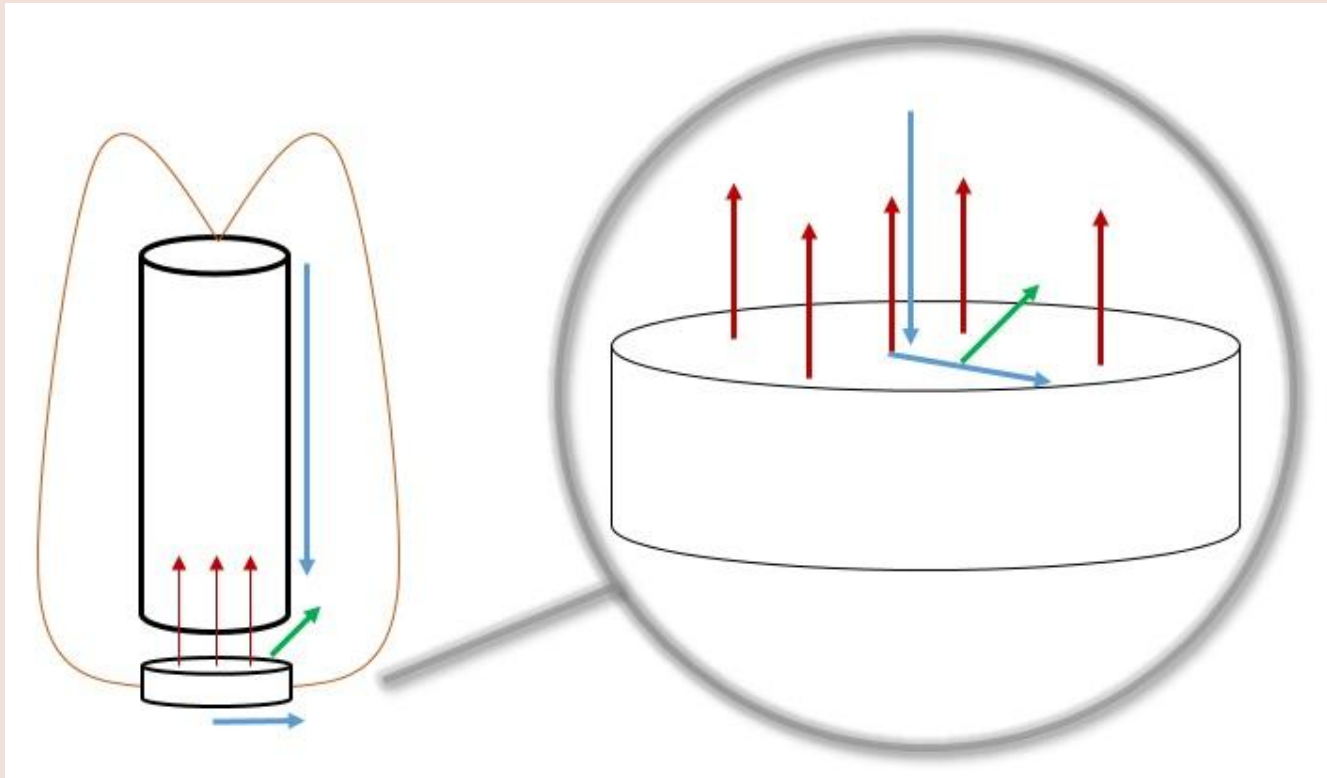
**HOW & WHY
DOES IT
WORK?**

HOW & WHY DOES IT WORK?

A homopolar motor is one of the simplest motors built due to the fact that it uses direct current to power the motor in one direction.

What's happening is that electrical current is flowing from the positive terminal of the battery to the negative and into the magnet. This current then flows from the centre of the magnet to the edge where the wire connects, it travels up the wire back to the positive terminal of the battery and the circuit is complete.

The key is the direction of the current and the magnetic field produced by the permanent magnet. As the current travels perpendicular to the magnetic field, a Lorentz Force is exerted on the conductor (the wire) which again is perpendicular to both the direction of the magnetic field and the current, generating the spinning motion.



The direction of the magnetic field is demonstrated by the red arrows and the direction of current is shown by the blue arrows.

LORENTZ FORCE

$$F = qE + qv \times B$$

The force exerted on a **charged particle q** moving with **velocity v** through an **electric field E** and **magnetic field B** . The entire electromagnetic force F on the charged particle is called the Lorentz force.

Develops due to the interaction of the applied magnetic field and the magnetic field generated by the particle in motion.

WHAT ARE THEY USED FOR?

Homopolar motors are useful for demonstrating electromagnetic forces and explaining the concepts behind how motors work. As an actual useful motor, don't expect much from it. You won't find a homopolar motor providing much useful work in common applications.

Because high currents flow through the wire the battery runs out very quickly. Due to the high currents of flow the wire and the battery overheat quickly.

LET'S REVIEW THE CONCEPTS WE'VE LEARNED



Question 02

True/False: When building a homopolar motor the wire can be bent into any shape as long as the shape is balanced?

Question 01

How many materials are required to build a homopolar motor?

- a) 2
- b) 5
- c) 4
- d) 8

Question 03

Is copper a conductor or an insulator?

Question 04

What is the name of the force involved in the functioning of a homopolar motor?

- a) Lorentz Force
- b) Newton Force
- c) Faraday Force



THANKS! QUESTIONS?

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SOURCES

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- https://isaacphysics.org/concepts/cp_lorentz_force
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