UNNES
UNIVERSITAS NEGERI SEMARANG
Kurikulum Merdeka | MERDEKA BELAJAR | Merdeka Mengajar

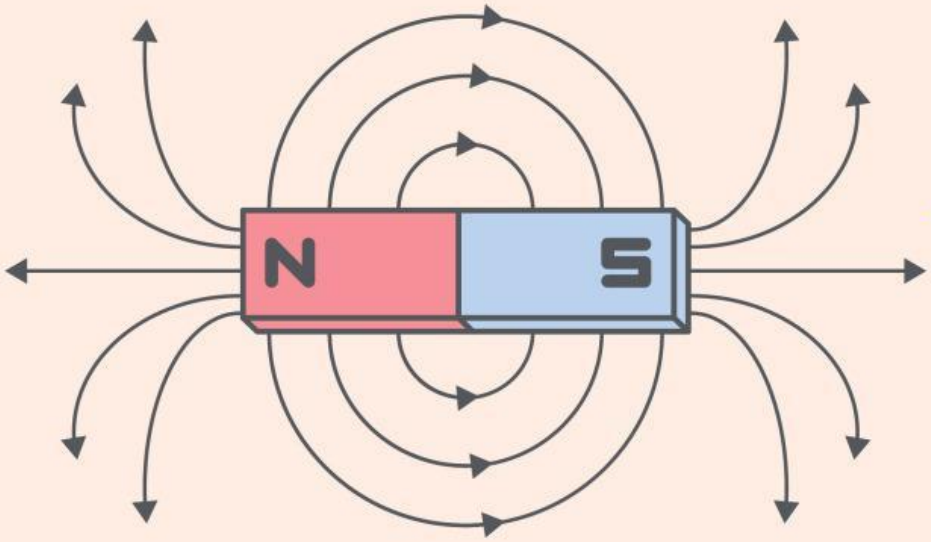
SCIENCE STUDENT WORKSHEET

MAGNETISM EXPERIMENT WITH A STEM APPROACH

"Magnetism and Its Applications in Daily Life"

Grade 9
Semester 2
Academic year 2025/2026

Preparated by:
Hana Nur Fadilah



Group Members

1. .....
2. .....
3. .....
4. .....
5. .....

STEM
LIVEWORKSHEETS

MAGNETISM EXPERIMENT

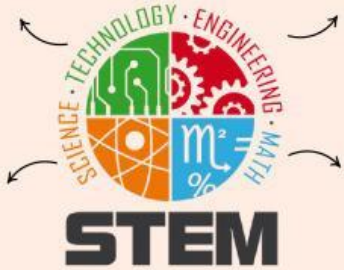
Learning Objective

1. Students understand the concept of magnetic phenomena after observing the interaction of magnets with various materials, by correctly identifying ferromagnetic, paramagnetic, and diamagnetic materials.
2. Students understand how to create magnets after conducting experiments using the rubbing, electromagnetic, and magnetic induction methods, by explaining the test results for at least one material from each magnetic category.
3. Students describe the utilization of magnetism in technological products after studying the working principles of devices such as digital compasses in detail.
4. Students analyze the differences in responses of ferromagnetic, paramagnetic, and diamagnetic materials to magnets after conducting observations and experiments with various materials.
5. Students design ways to utilize magnetic phenomena in everyday life based on experimental results, by explaining the working principles in detail.

STEM Integration

Technology
Students use a smartphone's digital compass to detect magnetic field interference and analyze how magnetometer sensors function in real-world technology.

Science
Students understand magnetic properties (ferromagnetic, paramagnetic, diamagnetic) and investigate how magnetization works through rubbing, electromagnetic, and induction methods.



Engineering
Students design and carry out their own experimental procedures, using problem-solving skills to test the effectiveness of different magnetization techniques.

Mathematics
Students measure the compass needle deviation in degrees using a protractor and compare angle changes between different magnetization methods.

Introduction

Magnetism is a physical phenomenon widely used in modern technology, such as electric motors, generators, and smartphone digital compasses. Objects around us respond differently to magnets depending on their magnetic properties: ferromagnetic, paramagnetic, or diamagnetic. By understanding these properties, we can explain how magnetic fields are used in everyday life.

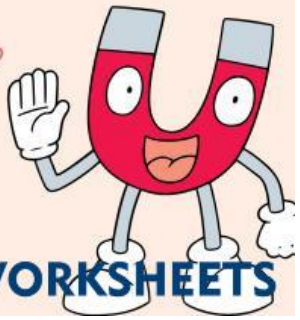
In this experiment, you will:

1. Classify materials based on their response to magnets.
2. Perform magnetization on ferromagnetic, paramagnetic, and diamagnetic materials using three methods.
3. Observe the effect of magnetic objects on the digital compass sensor in your smartphone.
4. For gifted students: develop a deeper understanding of magnetic sensor mechanisms and investigate how magnetic fields can be used in other technological applications.

Pre-Lab Questions

This section has been completed asynchronously

1. What are ferromagnetic, paramagnetic, and diamagnetic materials? Provide examples.
2. Why can only ferromagnetic materials be magnetized?
3. What happens when a magnetic object is brought near a smartphone's digital compass?



LIVEWORKSHEETS

Tools and Materials

Tools	Function
Magnet	Generates a magnetic field to test material responses and perform magnetization.
DIgital compass app (smartphone)	Detects magnetic field direction using the phone's magnetometer sensor.
Stopwatch / Wristwatch	Measures time during induction-based magnetization.
Protractor	Measures the angle of deviation of the compass needle.

Materials	Function
Test Objects (e.g., nails, keys, aluminum, plastic, wood) *min 5 objects	Used to investigate magnetic properties (ferromagnetic, paramagnetic, diamagnetic).
Copper Wire	Conducts electric current to create a magnetic field (used in the electromagnetic method).
Battery (1.5V or 9V)	Powers the electric current through the copper wire.

Experiment Task: Designing Your Own Procedure

You will work in a group to investigate the magnetic properties of various materials and test three magnetization methods: rubbing, electromagnetic, and magnetic induction. Before conducting the experiment, design your own steps using the tools and materials provided. Use the function table as a guide.

Your group's goals:

1. Classify materials based on their magnetic response.
2. Test magnetization using:
   a. Rubbing method
   b. Electromagnetic method (using copper wire and battery)
   c. Magnetic induction method
3. Observe the effect of each magnetized material on a digital compass.
4. Measure the compass needle deflection in degrees using a protractor.

Guidliness:

1. Decide how to organize the materials and how long to apply each method.
2. Think about how you will test and record the results.
3. Use the compass app to measure any changes, and record angle deviations using the protractor.
4. Write your procedure in the space below or in your science notebook.

Group-Designed Procedure

LIVEWORKSHEETS

Observation Results

1. Material Classification Table

Material	Reaction to magnet	Magnet property

2. Magnetization Test Table

Material	Magnetic property	Rubbing method	Electromagnetic method	Magnetic induction method

3. Effect on Digital Compass

- Did the compass needle deviate? _____
- If yes, how many degrees was the deviation? _____°

(Use a protractor to measure the angle between the initial and final direction of the needle.)

Conclusion (Fill in the blanks)

From this experiment, we observed that materials have different magnetic properties. _____ materials were strongly attracted to magnets, while _____ materials showed weak attraction, and _____ materials were not attracted at all. The most effective magnetization method for ferromagnetic materials was the _____ method, because _____. When we brought the magnetized materials close to the digital compass, the needle _____ by about _____ degrees, showing that _____. This proves that magnetic fields can affect _____ and are used in technologies such as _____.

Post-Lab Questions

This section will be be discussed at the end of the session.

1. Did your experimental results match your initial predictions? Explain.
2. How could you improve the accuracy of your observations in this experiment?
3. Based on the results, what is the role of magnetism in modern technology?
4. Mention other examples of magnetism in daily-life technology.

LIVEWORKSHEETS