

# Guided Exploration: AR Model of a Bar Magnet

Group ID:		Date:	
Student Name			
Members present			

## Objective

To use an Augmented Reality (AR) bar magnet simulation to explore and visualize the magnetic field lines around a bar magnet.

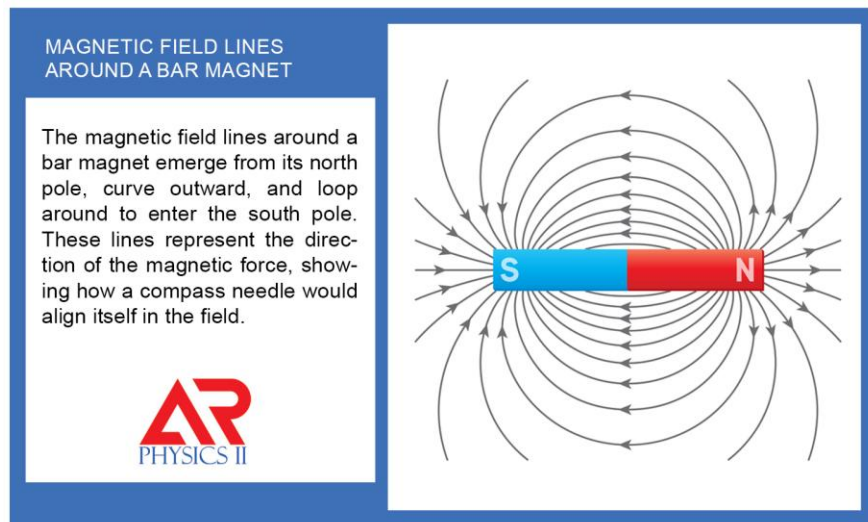
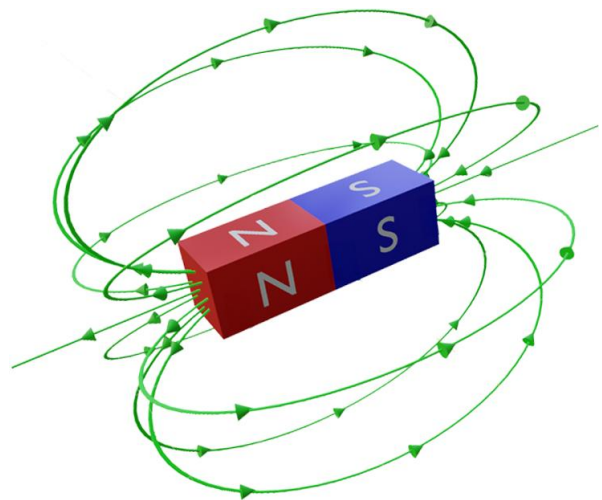


Figure 1: AR marker showing the magnetic field pattern around a Bar Magnet

## Part A: Getting Started with the AR Bar Magnet

1. Launching the Model
  - Open the AR app.
  - Scan the above marker
  - Move around to view the model from multiple angles.
2. What you should see
  - A bar magnet with North and South poles clearly indicated
  - Magnetic field lines emerging from one side and ending at the other side



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## Part B: Guided Exploration and discussions

### 3. Properties of the Magnetic Field Lines

- Observe the magnet from multiple viewing angles
- Examine the direction of the magnetic field lines. They are starting from the (North pole/ South Pole) and ending at the (North pole/ South Pole)
- When you are facing the north pole and looking along the axis of the bar magnet, which way is the magnetic field lines pointing—toward you or away from you?
- Where is the magnetic field line density highest? Near the poles or at the center away from the magnet?

### Think Pair Share

*While observing the AR model, imagine you can move a compass along the magnetic field lines. How will the compass needle behave? Will the needle always be pointing towards the magnet? Will it be pointing along the field lines or opposite? How will the compass behave near the north pole and at the south pole? How will your observations change if you replace the compass with a small levitating bar magnet which can be used to probe the surroundings? Discuss your predictions with a partner.*

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## Part C: Applying Knowledge (Near & Far Transfer)

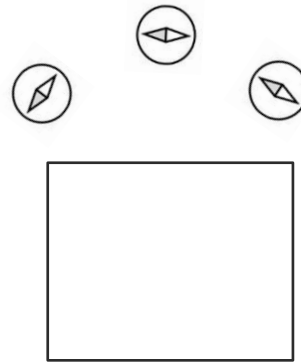
- 1) Outside a bar magnet, magnetic field lines always point from
  - a) South pole to north pole
  - b) North pole to south pole
  - c) Center to the poles
  - d) In random directions
  
- 2) Magnetic field lines around a bar magnet are best described as
  - a) Straight lines
  - b) Random curves
  - c) Closed continuous loops
  - d) Broken segments
  
- 3) What happens to magnetic field lines as you move farther away from a bar magnet?
  - a) They become closer together
  - b) They disappear suddenly
  - c) They spread farther apart
  - d) They reverse direction
  
- 4) If a compass is placed near the north pole of a bar magnet, the compass needle will
  - a) Point directly away from the magnet
  - b) Point directly toward the magnet
  - c) Align with the magnetic field lines
  - d) Spin in circles
  
- 5) The diagram shows a bar magnet and a black dot nearby. If you place a compass at the black dot in which direction will the compass point? (The dark side is the north of the compass)



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- 6) What does it mean when magnetic field lines are drawn closer together in a diagram?
- a) The field is weaker
  - b) The field is stronger
  - c) The field direction changes
  - d) The magnet is smaller
- 7) A bar magnet is hidden inside a box, and its orientation is unknown. A compass is placed at several locations around the box, and the directions of the compass needle at each position are shown. Based on these compass readings, determine the orientation of the magnet inside the box.

- a) 
- b) 
- c) 
- d) 



- 8) If the bar magnet is flipped end-to-end, the magnetic field lines
- a) Stay exactly the same
  - b) Disappear
  - c) Reverse direction
  - d) Become weaker
- 9) Which statement best describes the location of Earth's magnetic south pole?
- a) It is located near, but not exactly at, Earth's geographic north pole
  - b) It is located at Earth's geographic south pole
  - c) It is fixed at the center of the Earth
  - d) It is located near, but not exactly at, Earth's south geographic pole
- 10) Near which region do magnetic field lines curve the most sharply?
- a) At the center of the magnet
  - b) Near the poles
  - c) Far from the magnet
  - d) Inside the magnet