

Honors Physics
Electromagnetism Applications

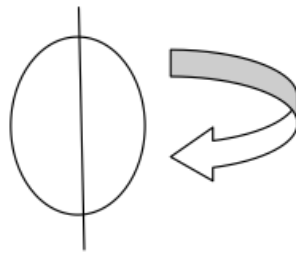
Assignment is due **Friday, June 6 by 3:00 pm**. Submit your work via Google Docs. Please title the document **LastNameFirstName**. Share (so I can edit) with danielle.bugge@ww-p.org.

Answer the following question in complete sentences. Include diagrams and references (proper MLA format) as relevant.

1. Is Earth the only planet with a magnetic field? Compare and contrast the magnetic field of Earth with another planet in the solar system. If possible, include information on the history and evolution of knowledge about that planet. What did scientists think about the planet in the past and how did new discoveries or new technologies change those ideas?

Answer 8 of the following 12 questions in complete sentences. Convince me that you understand and can apply the concepts of electromagnetism!! Include diagrams and references as relevant.

2. A small bar magnet is hidden inside a tennis ball. Describe at least 2 different experiments you could do to find the location of the N-pole and the S-pole of the magnet inside the ball **without** using another magnetic.
3. A room contains a strong, uniform magnetic field. A loop of fine wire in the room has current flowing through it. You rotate the loop until there is no tendency for it to rotate as a result of the magnetic field. What is the direction of the magnetic field relative to the plane of the loop? How does this situation apply to the operation of motors?



4. Research *superconductors*. Iron, nickel, and cobalt are electrical conductors. So are superconductors. But do they behave the same way in magnetic fields? Explain.
5. An electric field can exert a force on a charged particle. A magnetic field can exert a force on a charged particle as well. Can either force *change the kinetic energy* of the particle? Explain.
6. Find a diagram of the magnetic field lines around the Earth and include it in your report. Observe the density of the lines and explain where the magnetic field is strongest, the poles or the equator. Now, use this knowledge to *explain* at what location would the circular paths followed by *charged particles* have larger radii.

7. You are lost in the woods but you have a compass. Unfortunately, the red paint marking the N-pole of the compass has worn off. You do have a flashlight with a battery and a length of wire. Describe how you could identify the N-pole.
8. A strong current is suddenly switched on in a wire. No force acts on it. Can you conclude that there is no magnetic field at the location of the wire? Explain.
9. Research *alternating current*. The direction of AC voltage changes 120 times each second. Does that mean a device connected to an AC voltage alternately delivers and accepts *energy*?
10. A transformer is connected to a battery through an on/off switch. The secondary circuit contains a light bulb. Which of these statements best describes when the light bulb will be lit? a) as long as the switch is turned on; b) only the moment the switch is turned on; c) only the moment the switch is turned off. EXPLAIN.
11. Thomas Edison proposed distributing electrical energy using constant voltages (DC). George Westinghouse proposed using AC. Which was chosen and why is it a very economical choice after all?
12. When you drop a magnet (N-pole first) down a copper tube it seems to float down. Diagram the set up. EXPLAIN using the concepts of *induction*, *Lenz's Law*, *Conservation of Energy* and your right-hand rules.
13. A bicycle's headlight is powered by a generator that rubs against one of the wheels. Is the bike harder to pedal when the generator is lighting the lamp? Explain.