

Homework: Electricity and Magnetism

In this homework, we are going to take what we learned about **electricity** and **magnetism** and we going to combine those two phenomena.

- Discuss the microscopic origins of both electric charge and magnetism (what are the smallest constituents that “produce” the respective phenomena?). Point out similarities and differences.
- You cannot destroy these “constituents” or create them out of this air. This gives rise what is known as **conservation laws** (you already know about conservation of energy). Give a consequence of this you have seen in the labs for the case of electricity (Hint: think about the circuit labs) and magnetism (Hint: think about the magnetism demos).
- Discuss the similarities and differences of the electrostatic force between two charges and the magnetic force between two magnets. Touch on the following points:
 - How do they depend on the distance between two objects?
 - On what does it depend whether they are repulsive/attractive?
 - Do they produce torque (“rotational force”)?
 - How do they depend on the orientation of the objects?
- Review the connection between magnetism and electricity.
 - How can you create a magnetic field from charges?
 - How can you create current using magnets?
 - How can you create a force using magnets and charges?

Write up the explanations (aim for one page or less).