

Physics 102 – Spring 2014 – Recitation module 4

What are the similarities and differences between the force of electromagnetism (for static charges, Coulomb's Law) and the force of gravitation (as described by Newton's law of gravitation)?

Fundamentally, the basic force of gravitation is enormously weaker than the force of electromagnetism. Why is it that you are generally very aware of the force of gravitation on a daily basis and seldom aware of the force of electromagnetism?

Those of you who do your own laundry can tell the others about static cling. What is static cling? How do you think it comes about?

If the distance between two charged objects and the charges on each of the objects are all doubled, what happens to the electric force between them?

Two planets, A and B have masses $1M$ and $4M$, respectively. They exist out in space far from other objects. How does the gravitational force exerted by planet A on planet B compare with the gravitational force exerted by planet B on planet A.

Referring to the situation in the last question, how does the gravitational field of planet A at the location of planet B compare to the gravitational field of planet B at the location of planet A?

Your TA will supply the class with a bar magnet and iron filings. Put the bar magnet on a sheet of paper. Lightly sprinkle some iron filings around the paper. Lightly tap on the paper.

What do you see?

If you consider each little iron filing to be a small bar magnet, what is the shape of the “magnetic field” surrounding a bar magnet?

Your TA will supply your class with a set of bathroom scales. Groups should take turns taking the scales into a nearby elevator. Note the weight of a volunteer student when:

- the elevator is at rest.
- the elevator is accelerating upward during a trip to a higher floor.
- the elevator is moving at constant speed during its trip to a higher floor.
- the elevator is slowing down during its trip to a higher floor.
- the elevator is accelerating downward during the trip to a lower floor.
- the elevator is slowing down during a trip to a lower floor.
- the elevator is moving at a constant speed during its trip to a lower floor.

Now, get bring all the groups and see if you can make sense of your observations using Newton’s laws.

From your observations, estimate the highest acceleration of the elevator when it begins going up and when it begins going down.