Lab Combine – Electric Field

Overview

You will be working on a combination lab this week. The objective is to integrate your understanding of electric field, static forces and charge distribution.

Queries

Electric Field of Sphere:

- What is the electric field of a charged sphere?
- Draw the resulting field
- Write out the mathematical expression. Verify any simplifications are valid.

Electric Field of Plate:

- What is the electric field of a charged plate?
- Draw the resulting field
- Write out the mathematical expression. Verify any simplifications are valid.

Determine the charge on a plate and pith ball:

- In a prior lab you determined the product of the charge on a suspended pith ball and the associated charged plate assuming both were point charges. Use a more realistic model for the actual electric field from the plate to more accurately determine the charges on both the plate and the sphere.
  - Assume that both metal objects have the same charge density.
  - Assume that the sphere is aligned with the central axis of the plate.
  - How does your force diagram change?
  - Include uncertainty in your calculations.
  - Is it better to have a small diameter plate or a large diameter plate?

Experimental Considerations

- What would you need to experimentally verify any of the above questions?
- How does a Van de Graaf generator work?
  - Can you determine the sign of a charged VdG?
  - Do you have to have the belt touch the inside of the sphere?

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