Electric Fields – Part 1

The Electric Field

- Electric Field (E-field)
  - An area around any _____ causing an electric force on other charges around it.
- Michael Faraday
  - developed the concept of an _____ surrounding a charge in all directions. If a second charge is placed in the field, it will _____ with the field at that point

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Electric Field Intensity

- To find the intensity of an electric field we use :

$$E = \frac{F}{q}$$

  - q is usually a (+) test charge
  - Units of N/C

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Electric Field Sample Problem

- What is the electric field that is acting on a positive 4.0×10^{-5} C charge if it experiences a 0.60 N force?

Answer: 1.5×10^4 N/C

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Electric Field Sample Problem

- What is the force applied to a 5.0×10^{-9} C charge by a 1500 N/C electric field?
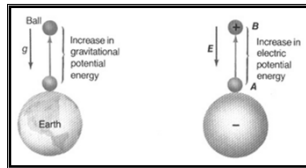
Answer: 7.5×10^{-6} N repulsive force

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Electric Fields – Part 1

Applications of E-Fields

- Electric potential energy
  - To pull unlike charges away from each other, you must do _____
  - Like gravitational PE, when you do work on an object, you increase its _____

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Electric Potential Difference

- Commonly known as _____
- Units of J/C or Volt (V)
- find using :

$$\Delta V = \frac{W}{q} \ \ \text{or} \ \ \frac{\Delta PE}{q}$$

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Applications of E-Fields

- Electric potential energy
  - Like Gravitational PE, Electric PE is based on an arbitrary reference point
  - We are mainly concerned with the differences in potential energy
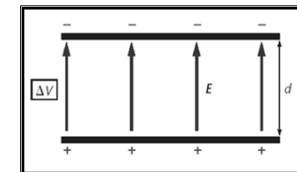 - Voltmeters are used to find potential differences

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Electric Potential in a <u>uniform</u> E-Field

- The potential difference between two points in an electric field depends on
  - the E-field strength
  - the distance between the points

  Such that

$$\Delta V = Ed$$

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Electric Fields – Part 1

Sample Problem

- Two charged parallel plates are 0.04 m apart. The electric field between them is 625 N/C.
  - What is the electric potential difference between the plates?
  - What work will you do to move a proton from the negative plate to the positive plate?

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Sample Problem (cont.)

- d = 0.04 m   E = 625 N/C

Answer: 25 V, 4.0 x 10^{-18} J

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