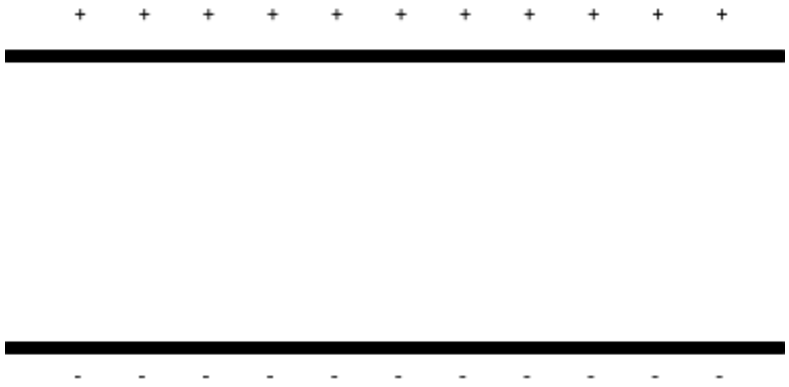
Electric Potential

1. Equipotential surfaces are perpendicular to the electric field lines that establish them. Draw some electric field lines and equipotential surfaces around two charges, +q and -q, that are held in the same region. Use solid lines and arrows for the electric field lines and dashed lines for the equipotential surfaces.

2. The electric field between two charged parallel plates consists of parallel lines. On the diagram below, draw some electric field lines and equipotential surfaces. Use solid lines and arrows for the electric field lines and dashed lines for the equipotential surfaces.



3. A +5.0 μC charge is placed at the 0.0 position of a meter stick and a -3.0 μC charge is placed at the 10.0 cm position.
    a. Calculate the total electric potential at the 3.0 cm position.
    b. What direction does the electric field point at the 3.0 cm position?
    c. What direction would a -2.0 μC charge be pushed if placed at the 3.0 cm position?
    d. Calculate the total electric potential at the 8.0 cm position.
    e. Calculate the potential difference between the 3.0 cm and 8.0 cm positions.
    f. Calculate the change in the potential energy of the system if a -2.0 μC charge moves from the 3.0 cm position to the 8.0 cm position.
    g. Assume the charge starts at rest at 3.0 cm, would this motion require outside work done on the system? Explain your reasoning.

4. Ionized hydrogen atoms are accelerated from rest in the vacuum between two vertical parallel conducting plates. The potential difference between the plates is *V*. As a result of the acceleration each ion gains an energy of 1.9×10^{-18}J.
    a. Calculate the value of *V*.
    b. The electric field between the plates can be considered a constant. If the gap between the plates is 2.0 cm, what is the electric field between the plates?

5. Some distribution of charges establishes the equipotential surfaces show at the right.
    a. Sketch the electric field vectors at each point identified.
    b. Which direction would an electron travel if free to move on its own, L to P or P to L? Explain your reasoning.
    c. What is the potential difference between L and O?
    d. Calculate the change in potential energy for a proton that moves from L to O.
    e. How fast would the proton be traveling when it reaches O if it started at rest at L?
    f. How much work would be done to move an electron from point M to point N?