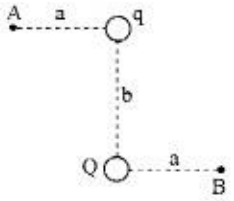
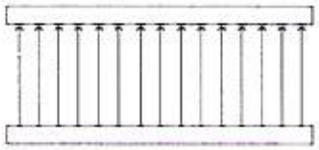
Electric Potential – Homework 3

1. A charged particle (q=-0.8mC) moves in a region where the only force acting on the particle is an electric force. If the particle is released from rest in point A and reaches point B with a kinetic energy of 4.8 J. What is the electric potential difference V_B-V_A?
2. Points A=(2,3)m and B=(5,7)m are in a region where the electric field is uniform and given by **E**=(4i+3j) N/C. What is the potential difference V_B-V_A between these two points?
3. A particle of mass=$6.7\text{x}10^{-27}$kg and charge=$3.2\text{x}10^{-19}$C moves along the x axis in the positive direction with a speed of $4.8\text{x}10^5$ m/s. It enters a region of uniform electric field parallel to its motion and comes to rest after moving 2.0 m into the field. What is the magnitude of the electric field?
4. Consider a 2 mC charge at the origin of coordinates, how much work is necessary to bring a 3mC charge from infinity to a point with coordinates (3,4). Is the work done by the external agent positive or negative?
5. Consider a 2 mC charge at the origin of coordinates, what is the potential difference between A=(0,2) and B=(0,3)
6. Point charges q and Q are positioned as shown in the figure (the angles are 90°). If q=+2nC and Q=-2nC, a=3m and b=4m, what is the electric potential difference, V_B-V_A? What would this potential difference be if Q where positive?



7. Consider three charges $q_1=2nC$ located at the origin of coordinates, $q_2=-1nC$ with coordinates (3,0), and $q_3=3nC$ with coordinates (0,4). Calculate the total potential energy of this system. How much energy would be necessary to assemble this system by bringing one charge at a time from infinity?
8. If the distance between the two plates in the figure is 0.5 m and the electric field is 20N/C, calculate the potential difference between the plates. Is the top plate at higher or a lower electrical potential than the one at the bottom?



9. Consider the electric potential on a particular reagion is given by $V(x,y)=3x+2y^2$. Calculate the electric field E(x,y).
10. A nonconducting sphere of radius 10 cm is charged uniformly with a charge density of 100 nC/m^3. What is the magnitude of the potential difference between the center and a point 4 cm away from the center? What is the potential difference between the center and another point 15 cm away?
11. How much electrical charge is needed to establish and electrostatic potential of $1\text{x}10^6$ V on an isolated metal sphere of radius 1 m?
12. To recharge a 12-V battery, a battery charger must move $3.6\text{x}10^5$C of charge from the negative to the positive terminal. What amount of work is done by the battery charger? How many kilowatt hours is this?