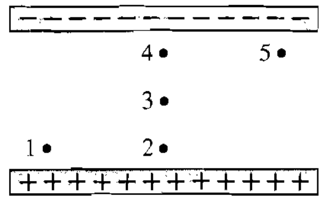
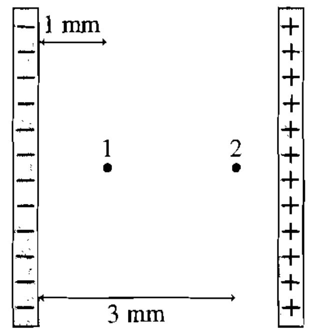
Name: ______________________ **Problems Solved __/ 10**

Rank in order from largest to smallest the electric potentials V_1 to V_5 in the picture. Does it matter what reference point you use?



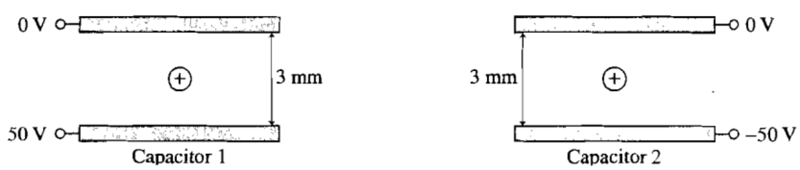
The figure to the right shows two points inside a capacitor.



(a) What is the ratio of the electric potential differences $\frac{\Delta V_2}{\Delta V_1}$ with respect to the negative plate?

(b) What is the ratio, $\frac{E_2}{E_1}$, of the electric field strength at these two points?

The figure shows two capacitors (sets of charged parallel plates), each with a 3 mm separation. A proton is released from rest in the center of each capacitor.



(a) Draw an arrow on each proton to show the direction it moves.

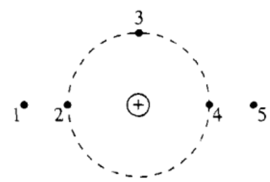
(b) Which proton reaches a capacitor plate first? Or are they simultaneous? Explain.

A capacitor with plates separated by a distance d is charged to a potential difference ΔV_c. Then the two plates are pulled apart to a new separation of distance 2d. (Assume that the plates are very large compared to the separation distances.)

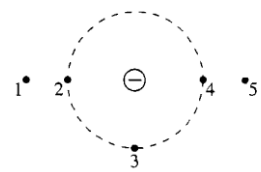
(a) Does the electric field strength E change as the separation increase? If so, by what factor? If not, why not?

(b) Does the potential difference ΔV_c change as the separation increases? If so, by what factor? If not, why not?

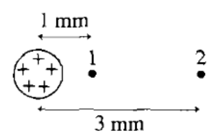
Rank the electric potentials V_1 to V_5 in order from largest to smallest.



Rank in order, from most positive to most negative, the electric potentials V_1 to V_5 at the points shown.



The figure shows two points near a positive point charge.



(a) What is the ratio of the potential differences $\frac{\Delta V_1}{\Delta V_2}$ with respect to infinity .

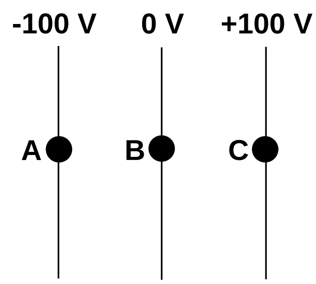
(b) What is the ratio of the electric field strengths $\frac{E_1}{E_2}$ at these two points?

Suppose that E = 0 V/m throughout some region of space. Can you conclude that V = 0 V in this region? Explain.

Suppose that V = 0 V throughout some region of space. Can you conclude that E = 0 V/m in this region? Explain.

A proton is released from rest at a point B, where the potential is 0 V. Afterward, the proton

(a) Remains at rest at B.
(b) Moves toward A with steady speed.
(c) Moves toward A with an increasing speed.
(d) Moves toward C with a steady speed.
(e) Moves toward C with an increasing speed.



What is the answer if the proton is replaced by an electron?

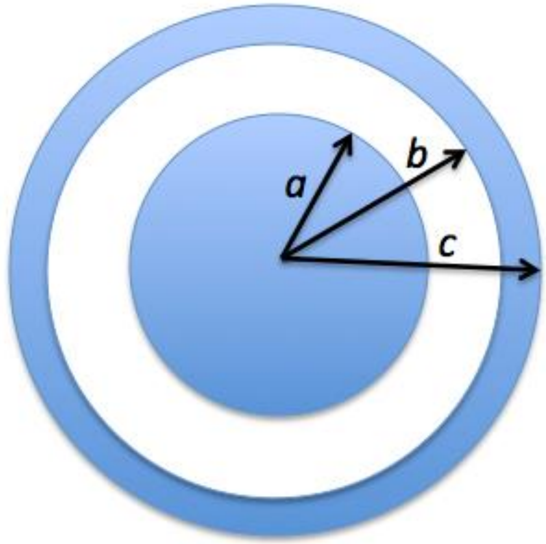
A solid spherical insulator of radius *R* has a total charge *Q* distributed uniformly throughout its volume. Find the electric potential at the sphere's center with respect to infinity using $\Delta V = -\int \vec{E} \cdot d\vec{r}$.

Technique: Use **Gauss's Law** to find the electric field both outside and inside. Then, find the potential at the center by adding two the integrals, from r=0 to r=*R* and from r=*R* to $r = \infty$.

A solid spherical insulator of radius R has a total charge Q distributed uniformly throughout its volume.

Find the velocity of a particle of charge $-q$ and mass m released from rest at infinity as it reaches the sphere's surface.

A solid *conducting* sphere with net charge $+Q$ and radius of a is surrounded by a concentric *insulating* spherical shell with an inner radius of b and an outer radius of c. The shell has a net charge of $-Q$ uniformly distributed throughout its volume.



a) Find the potential difference from the center to point a.
b) Find the potential difference from point a to point b.
c) Find the potential difference from point b to point c.
   (Just set up the integral, don't solve it)
d) Find the potential difference from point c to infinity.

1. Wolfson, Volume II, 2nd Edition, 22.48

2. Wolfson, Volume II, 2nd Edition, 22.49

3. Wolfson, Volume II, 2nd Edition, 22.64

4. Wolfson, Volume II, 2^{nd} Edition, 22.65