Ch25 (Homework)
Current Score : – / 31 **Due :** Monday, August 27 2018 02:15 PM CDT

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1. –/3 pointsSerPSE9 25.P.001.MI.FB.

Oppositely charged parallel plates are separated by 5.40 mm. A potential difference of 600 V exists between the plates.

(a) What is the magnitude of the electric field between the plates?
[ ] N/C

(b) What is the magnitude of the force on an electron between the plates?
[ ] N

(c) How much work must be done on the electron to move it to the negative plate if it is initially positioned 2.92 mm from the positive plate?
[ ] J

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2. –/4 pointsSerPSE9 25.P.008.

(a) Find the electric potential difference ΔV_e required to stop an electron (called a "stopping potential") moving with an initial speed of 2.75×10^7 m/s.

[ ] kV

(b) Would a proton traveling at the same speed require a greater or lesser magnitude of electric potential difference?

- greater
- lesser
- equal

Explain.

This answer has not been graded yet.

(c) Find a symbolic expression for the ratio of the proton stopping potential and the electron stopping potential, $\Delta V_p/\Delta V_e$. (Use the following as necessary: m_p for the mass of proton and m_e for the mass of electron.)

$$\frac{\Delta V_p}{\Delta V_e} =$$

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3. –/3 pointsSerPSE9 25.P.012.

(a) Calculate the electric potential 0.100 cm from an electron.

[ ] V

(b) What is the magnitude of the electric potential difference between two points that are 0.100 cm and 0.870 cm from an electron?

[ ] V

(c) How would the answers change if the electron were replaced with a proton?

- The sign of answer (a) would change.
- The sign of answer (b) would change.
- The sign of both answers would change.
- Both answers would remain the same.

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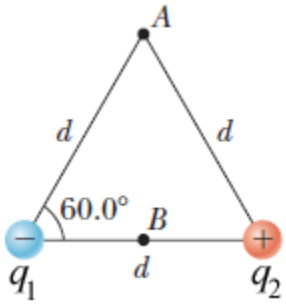
4. –/2 pointsSerPSE9 25.P.014.

The two charges in the figure below are separated by d = 3.50 cm. (Let q_1 = -19 nC and q_2 = 28.5 nC.)



(a) Find the electric potential at point A.

[ ] kV

(b) Find the electric potential at point B, which is halfway between the charges.

[ ] kV

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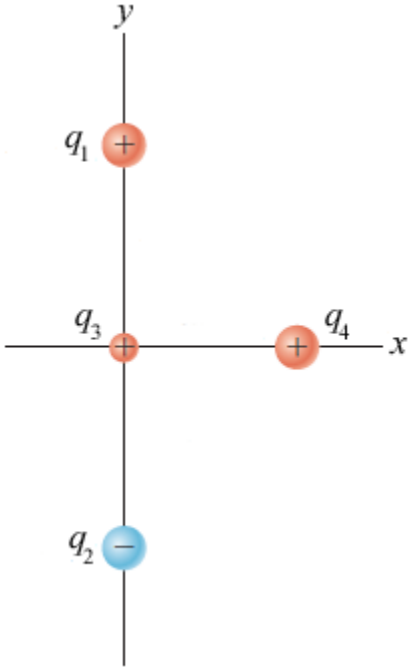
5. –/2 pointsSerPSE9 25.P.017.

Two particles, with charges of $q_1 = 90.0$ nC and $q_2 = -90.0$ nC, are placed at the points with coordinates (0, 12.00 cm) and (0, −12.00 cm) as shown in the figure below. A particle with charge $q_3 = 45.0$ nC is located at the origin.



(a) Find the electric potential energy of the configuration of the three fixed charges.

[ ] J

(b) A fourth particle, with a mass of 2.34×10^{-13} kg and a charge of $q_4 = 180.0$ nC, is released from rest at the point (9.00 cm, 0). Find its speed after it has moved freely to a very large distance away.

[ ] m/s

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6. –/4 pointsSerPSE9 25.P.031.

Two insulating spheres have radii 0.300 cm and 0.500 cm, masses 0.400 kg and 0.700 kg, and uniformly distributed charges of -2.00 μC and 5.50 μC. They are released from rest when their centers are separated by 1.00 m.

(a) How fast will each be moving when they collide? (Hint: Consider conservation of energy and of linear momentum.)

[ ] m/s (lighter sphere)

[ ] m/s (heavier sphere)

(b) If the spheres were conductors, would the speeds be greater or less than those calculated in part (a)? (Note: Assume a reference level of potential $V = 0$ at $r = \infty$.)

- less than
- greater
- the same

Explain your answer.

This answer has not been graded yet.

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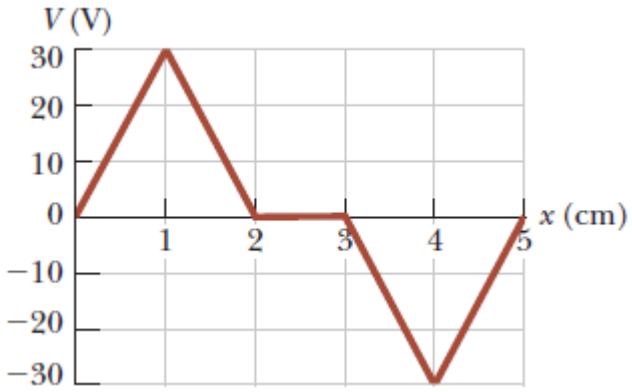
7. –/1 pointsSerPSE9 25.P.038.

An electric field in a region of space is parallel to the *x* axis. The electric potential varies with position as shown in the figure below. Graph the *x* component of the electric field versus position in this region of space.



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This answer has not been graded yet.

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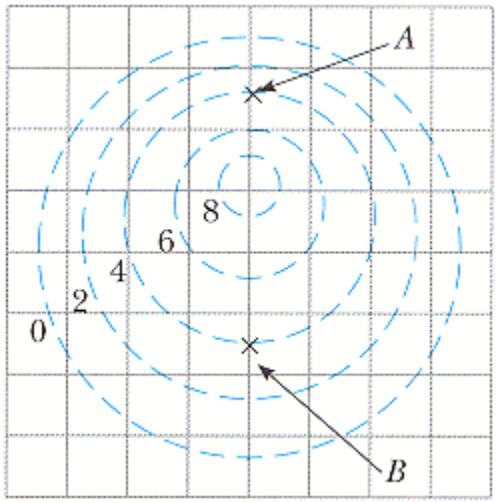
8. –/5 pointsSerPSE9 25.P.040.

The figure below shows several equipotential lines each labeled by its potential in volts. The distance between the lines of the square grid represents 1.50 cm.



(a) Is the magnitude of the field bigger at *A* or at *B*?

- $E_A > E_B$
- $E_A < E_B$

Why?

This answer has not been graded yet.

(b) What is $\vec{\mathbf{E}}$ at *B*?

N/C

--Direction--

(c) Represent what the field looks like by drawing at least eight field lines.

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This answer has not been graded yet.

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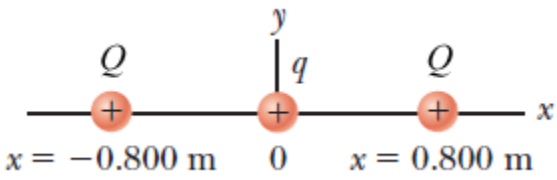
9. –/3 pointsSerPSE9 25.P.019.WI.

Given two particles with Q = 2.10-μC charges as shown in the figure below and a particle with charge q = 1.20 × 10^{-18} C at the origin. (Note: Assume a reference level of potential V = 0 at r = ∞.)



(a) What is the net force exerted by the two 2.10-μC charges on the charge q?
[ ] N

(b) What is the electric field at the origin due to the two 2.10-μC particles?
[ ] N/C

(c) What is the electrical potential at the origin due to the two 2.10-μC particles?
[ ] kV

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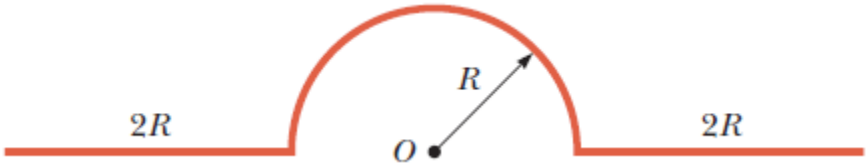
10. –/1 pointsSerPSE9 25.P.047.WI.

A wire having a uniform linear charge density λ is bent into the shape shown in the figure below. Find the electric potential at point O. (Use the following as necessary: R, k_e and λ.)
V =



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11. –/1 pointsSerPSE9 25.P.065.

From Gauss's law, the electric field set up by a uniform line of charge is given by the following expression where $\hat{\mathbf{r}}$ is a unit vector pointing radially away from the line and λ is the linear charge density along the line.

$$\vec{\mathbf{E}} = \left(\frac{\lambda}{2\pi\epsilon_0 r}\right)\hat{\mathbf{r}}$$

Derive an expression for the potential difference between $r = r_1$ and $r = r_2$. (Use any variable or symbol stated above along with the following as necessary: ε_0 and π.)

$V_2 - V_1 =$

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12. –/2 pointsSerPSE9 25.P.041.

The electric potential inside a charged spherical conductor of radius R is given by $V = k_eQ/R$, and the potential outside is given by $V = k_eQ/r$. Using $E_r = -dV/dr$, derive the electric field inside and outside this charge distribution. (Use the following as necessary: k_e, Q, r and R.)

(a) inside

$E =$

(b) outside

$E =$

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