Physics 2B, Electricity and Magnetim -- Winter 2009 Instructor: B. Grinstein
Quiz # 3

INSTRUCTIONS: Fill, tear and return the bottom strip of the front page with your scantron. Keep the top portion of the front page and the rest of the quiz. Use a pencil #2 to fill your scantron. Write your code number and bubble it in under "EXAM NUMBER". Bubble in the quiz form (see letter A--D at bottom of page) in your scantron under "TEST FORM"

Useful numbers: $K = 9.0 \times 10^{9}\ Nm^2/C^2$, $\varepsilon_o = 8.85 \times 10^{-12}\ C^2/Nm^2$, $e = 1.60 \times 10^{-19}\ C$, $m_e = 9.11 \times 10^{-31}\ kg$
$\mu_o = 4\ \pi \times 10^{-7}\ T\ m/A$

1) An electron was accelerated from rest through a potential difference of 5500 V. What is its speed?
A) 2.2×10^{7} m/s B) 4.4×10^{7} m/s C) 3.7×10^{7} m/s D) 2.9×10^{7} m/s

2) A parallel plate capacitor contains a positively charged plate on the left, and a negatively charged plate on the right. An electron in between the plates is moving to the right. Which statement is true?
A) The potential energy of the electron is decreasing and it is moving to a region having a lower potential.
B) The potential energy of the electron is increasing and it is moving to a region having a lower potential.
C) The potential energy of the electron is decreasing and it is moving to a region having a higher potential.
D) The potential energy of the electron is increasing and it is moving to a region having a higher potential.

3) A proton and an electron are in a constant electric field created by oppositely charged plates. You release the proton from the positive side and the electron from the negative side simultaneously. Which of the following is true?
A) When they hit the opposite plate the kinetic energies of proton an electron are equal, so the electron and proton hit the opposite plate at the same time.
B) When they hit the opposite plate the kinetic energies of proton an electron are equal, but the electron hits the opposite plate earlier than the proton.
C) The electric force acting on the electron has larger magnitude than that on the proton. Therefore the electron hits the opposite plate earlier than the proton.
D) The electric force acting on the electron has larger magnitude than that on the proton. Therefore when they hit the opposite plate the electron has larger kinetic energy than the proton.
E) None of the above is true.

4) Consider a circular ring of charge of radius R. Half of the ring carries charge +Q (uniformly distributed), while the other half carries charge -Q (also uniform).
A) The potential along the axis of the ring decreases inversely with the square root of the distance from the center of the ring.
B) At distances much larger than R the potential along the axis of the ring decreases inversely with distance from the center of the ring, but for distances smaller than R the potential along the axis increases with distance.
C) The potential along the axis of the ring decreases inversely with distance from the center of the ring.
D) The potential along the axis of the ring decreases inversely with the square of the distance from the center of the ring.
E) None of the above.

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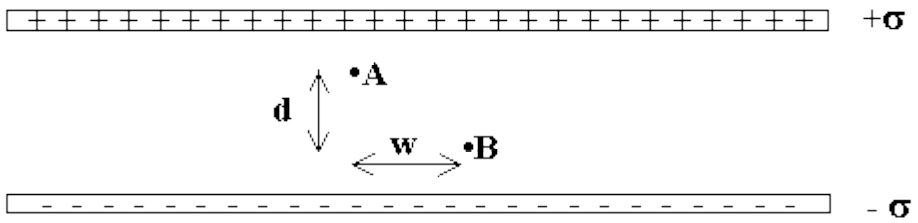
5) Consider two large, insulating plates as show below. The upper plate has a surface charge density $+\sigma$; the lower plate has a surface charge density $-\sigma$. The magnitude of the electric field is $8\pi k\sigma$ between the plates and 0 outside. ΔV_{AB} is the electrostatic potential difference between A and B.



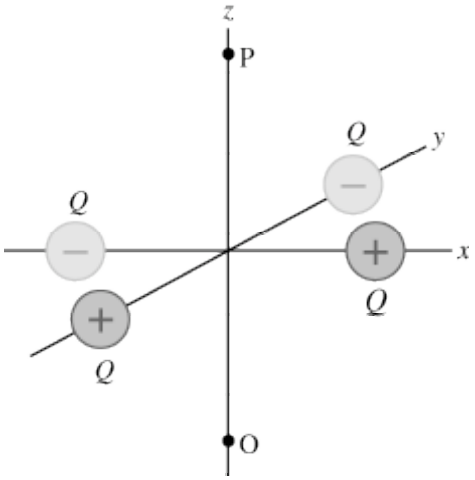
If the charge density on both plates is doubled and the distance w is halved, the potential difference between A and B becomes:

A) $\frac{d+w}{w}\Delta V_{AB}$ B) $\frac{d}{w}\Delta V_{AB}$ C) $4\Delta V_{AB}$ D) $2\Delta V_{AB}$ E) ΔV_{AB}

6) Eight 1.0 μC charges are located at the vertices of a unit cube centered about the origin with 1.0 mm edges. The work it takes to bring a 6.0 μC charge from infinity to the origin is closest to

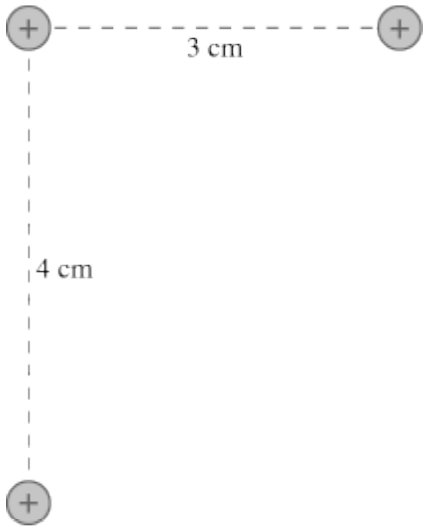
A) 500 J B) 860 J C) 38 J D) 610 J

7) Four charged particles (two having a charge $+Q$ and two having a charge $-Q$) are distributed on the xy-plane, as shown below. Each charge is equi-distant from the origin. The voltage is zero at infinity. The amount of work required to to move a positively charged particle from point P to point O (which is on the z-axis, below the origin) is



A) positive.
B) zero.
C) negative.
D) depends on the path in which the charged is moved.

8) Consider the group of charges in this figure. All three charges have Q= 1.7 nC. What is their electric potential energy?



A) 2.1×10^{-6} J B) 2.3×10^{-6} J C) 2.0×10^{-6} J D) 2.2×10^{-6} J

Answer Key
Testname: QZ3

1) B
2) B
3) B
4) E
5) D
6) A
7) B
8) C

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