AP Physics – Ch. 15 Take-home Quiz (3B) –Due: Wednesday, March 5, 2014

Directions: Show all of your work (calculations/explanations) on a separate sheet of paper.

1) A metal sphere is insulated electrically and is given a charge. If 50 electrons are added to the sphere in giving a charge, how many Coulombs are added to the sphere?

A) - 50 C
B) - 80 C
C) - 8.0×10^{-18} C
D) - 8.0×10^{-20} C

2) A small piece of aluminum (atomic number 13) contains 10^{15} atoms. (The atomic number is the number of protons; it determines the (positive) electric charge of the nucleus and, thus, the number of electrons in a neutral atom.) If the piece of aluminum has a net positive charge of 3.0 μC, what fraction of the electrons that the aluminum had when it was neutral would have had to be lost?

A) $\frac{3}{2080}$
B) 1.9×10^{-20}
C) $\frac{3}{160}$
D) 1.4×10^{-21}

3) Suppose a van de Graaff generator builds a negative static charge, and a grounded conductor is placed near enough to it so that a 9.0 nC of negative charge arcs to the conductor. Calculate the number of electrons that are transferred.

A) 1.12×10^{-18}
B) 5.63×10^{13}
C) 5.63×10^{10}
D) 9.0

4) A proton is located at x = 1.0 nm, y = 0.0 nm and an electron is located at x = 0.0 nm, y = 4.0 nm. Find the attractive electric force between them. (The value of k is 9.0×10^9 N·m²/C².)

A) 5.3×10^{-18} N
B) 5.9×10^{-15} N
C) 1.4×10^{-11} N
D) 5.3×10^{8} N

5) Three charges of magnitude 3.0×10^{-4} C each are located at x = 1.0 m, y = 1.0 m, at s = 0.0 m, y = 0.0 m, and at x=-1.0 m, y = 0.0 m. The one in the middle is negative, while the other two are positive. What is the net electric force exerted by them on a negative 3.0×10^{-5} C charge located at x = 0.0 m, y = 2.0 m? (The value of k is 9.0×10^9 N·m²/C².)

A) 87 N attractive
B) 87 N repulsive
C) 120 N attractive
D) 120 N repulsive

6) The electric field 2.8 cm from a small object points away the object with a strength of 180,000 N/C. What is the object's charge?

A) + 16 nC
B) - 16 nC
C) + 17 nC
D) - 17 nC

7) Two identical small charged spheres are a certain distance apart, and each initially experiences an electrostatic force of magnitude F due to the other. With time, charge gradually diminishes on both spheres. When each of the spheres has lost half its initial charge, the magnitude of the electrostatic force will be:

A) 1/16 F.
B) 1/8 F.
C) 1/4 F.
D) 1/2 F.

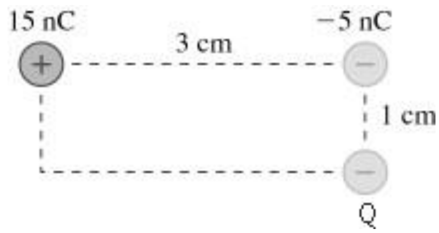
8) Two electrons are passing 26.0 mm apart. What is the electric repulsive force that they exert on each other? (The value of k is 9.0×10^9 N·m²/C².)

A) 3.4×10^{-27} N
B) 3.4×10^{-25} N
C) 1.3 N
D) 1.3×10^{10} N

9) What is the magnitude of an electric field that balances the weight of a plastic sphere of mass 6.4 g that has been charged to -3.0 nC?

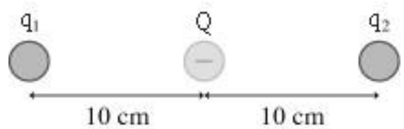
A) 2.1×10^7 N/C
B) 2.4×10^6 N/C
C) 4.5×10^6 N/C
D) 6.4×10^6 N/C

10) The charge in the bottom right corner of the figure is Q = - 45 nC. What is the magnitude of the force on Q?



A) 1.4×10^{-2} N
B) 1.9×10^{-2} N
C) 2.6×10^{-2} N
D) 3.5×10^{-2} N

11) In the figure below the charge in the middle is Q = -3.1 nC. For what charge q_1 will charge q_2 be in static equilibrium?

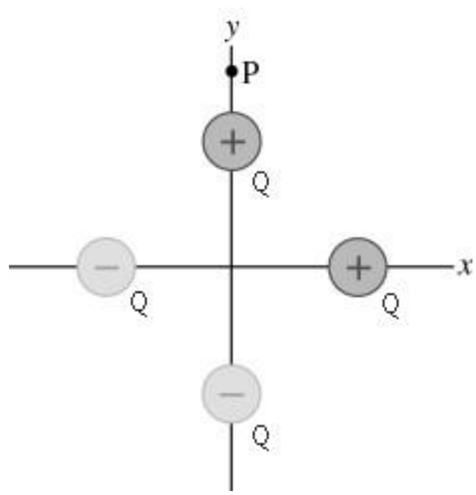


A) 3.1 nC
B) 6.2 nC
C) 12 nC
D) 25 nC

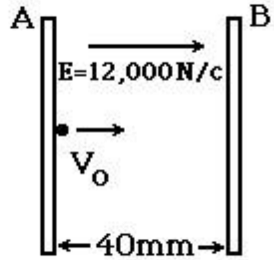
12) What is the strength of an electric field that a 0.010 C negative charge experiences 0.90 mm from a 0.20 C positive charge? (The value of K is 9.0×10^9 N·m²/C².)

A) 2.2×10^{15} N/C
B) 5.6×10^{16} N/C
C) 1.1×10^{15} N/C
D) 2.2×10^{16} N/C

13) Four charged particles (two having a charge +Q and two having a charge -Q) are distributed as shown below. Each charge is equidistant from the origin. In which direction is the net electric field at the point P, which is on the y axis?



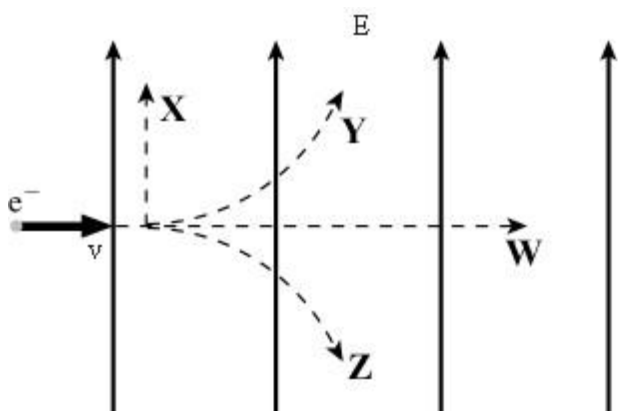
A) directly up (in the positive y direction)
B) directly left (negative x direction)
C) upwards, toward the left
D) upwards, toward the right



14) A pair of charged conducting plates produces a uniform field of 12,000 N/C, directed to the right, between the plates. The separation of the plates is 40 mm. In the figure, an electron is projected from plate A, directly toward plate B, with an initial velocity of $v_o = 2.0 \times 10^7$ m/s. The velocity of the electron as it strikes plate B is closest to:

A) 1.2×10^7 m/s
B) 1.5×10^7 m/s
C) 1.8×10^7 m/s
D) 2.1×10^7 m/s
E) 2.4×10^7 m/s

15) An electron is initially moving to the right when it enters a uniform electric field directed upwards. Which trajectory shown below will the electron follow?



A) Trajectory W
B) Trajectory X
C) Trajectory Y
D) Trajectory Z