PHYSICS 12 ELECTROSTATICS WORKSHEET 2
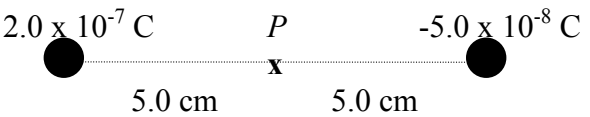
1. A source charge **q** exerts an electrical force of 4.0×10^{-17} N on an electron located at point P. What is the electric field strength at point P?

2. How much force is exerted on an alpha particle (see sheet #1) by an electric field when the α particle is placed at a location where the electric field strength is 75 N/C?

3. The force on a charge of -2.0×10^{-4} C is measured and found to be 0.24 N in a downward direction. What is the electric field at this point?

4. Compute:
    a) the electric field intensity E in air at a distance of 30.0 cm from a point charge
        $q_1 = 5.0 \times 10^{-9}$ C.
    b) the force on a charge $q_2 = 4.0 \times 10^{-10}$ C placed 30.0 cm from q_1.

5. A charge of 6.0 μC experiences a force of 2.0×10^{-3} N in the +x-direction at a certain point in space.
    a) What was the electric field at that location <u>before</u> the charge was placed there?
    b) Describe the force a -2.0 μC charge would experience if it were used in place of the 6.0 μC charge.

6. A dipole is made up of two charges, **q** = +3 C and **Q** = -3 C, that are separated by a distance of 1.0 m. What is the electric field strength of the field set up by these two charges at a point exactly halfway between them?

7. For the situation shown to the right, find:
    a) the electric field E at point P.
    b) the force on a 4.0×10^{-8} C charge placed at P.
    c) where in the region the electric field would be zero. (Hint: 2 equations)

    2.0×10^{-7} C $\quad\quad P \quad\quad$ -5.0×10^{-8} C

    ●---------------**x**---------------●

    5.0 cm $\quad\quad$ 5.0 cm

8. A plastic sphere carrying a negative charge of 3.2×10^{-19} C is held stationary by an electric field of 2.0×10^4 N/C. What is the weight of the sphere?

9. As shown to the right, two identical 1.0×10^{-4} kg balls carry identical charges and are suspended by two threads of equal length. Find the charge on either ball. (Hint: examine one ball only; the $\mathbf{F_E}$ on it is the same as for the other)

    60° $\quad\quad$ 60°
    ← 40 cm →
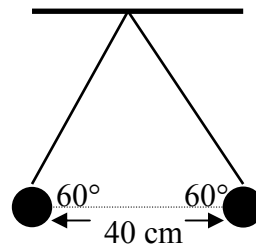
10. The potential energy of a proton is 5.0×10^{-18} J at a certain point in an electric field. What is the electric potential at this point if the proton is removed?

11.   An object with charge **q** = 2.0 x 10^{-16} C is located 1.0 cm from another object with charge **Q** = 2.0 x 10^{-10} C.
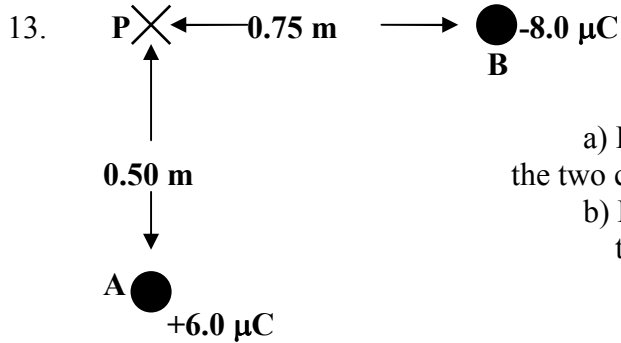a) What is the potential energy of **q**?
b) What is the electric potential at the point occupied by **q** if **q** is removed?

12.   A proton is located 0.80 m from a source charge **Q** = 3.0 C.
a) How much work is required to move the proton to a point 0.50 m from **Q**?
b) What force was used to move the proton?

13.   **P**✕———0.75 m ———→ ●-8.0 μC
                                   B

       0.50 m

       a) Determine the electric field at point **P** due to the two charges shown.
       b) Determine the electric potential at point **P** due to those same charges.

       A●
          +6.0 μC

14.   A **+9.0 μC** charge is placed at point **P** in the diagram above.
a) Determine the net force acting on the **+9.0 μC**.
b) Determine the potential energy of the **+9.0 μC** due to the other two charges.

1. 2.5 x 10^2 N/C   2. 2.4 x 10^{-17} N   3. 1.2 x 10^3 N/C up   4. a) 500 N/C b) 2.00 x 10^{-7} N, repulsive
5. a) 3.3 x 10^2 N/C in x-dir b) 6.7 x 10^{-4} N in x-dir   6. 2.2 x 10^{11} N/C
7. a) 9.0 x 10^5 N/C b) 3.6 x 10^{-2} N to right c) 0.10 m to the right of the -5.0 x 10^{-8} C charge   8. 6.4 x 10^{-15} N
9. 0.10 μC   10. 31 V   11. a) 3.6 x 10^{-14} J b) 180 V   12. a) 3.2 x 10^{-9} J b) 1.1 x 10^{-8} N
13. a) 2.5 x 10^5 N/C @ 31° left of line A-P b) 1.2 x 10^4 V   14. a) 2.3 N @ 31° left of line A-P b) 0.11 J