Electric Fields #1

1. A positive charge of 1.0×10^{-5} C experience a force of 0.20 N when located at a certain point. What is the electric field intensity at that point?

2. What charge exists on a test charge that experiences a force of 1.4×10^{-8} N at a point where the electric field intensity is 2.0×10^{-4} N/C?

3. A test charge experiences a force of 0.20 N on it when it is placed in an electric field intensity of 4.5×10^{5} N/C. What is the magnitude of the charge?

4. The electric field in the atmosphere is about 150 N/C downward.
   (a) What is the direction of the force on a charged particle?
   (b) Find the electric force on a proton with charge + 1.6×10^{-19} C.
   (c) Compare the force is (b) with the force of gravity on the same proton.

5. Sketch
   (a) The electric field produced by a +1.0 μC charge.
   (b) The electric field resulting from a +2.0 μC charge.

6. Charges X, Y, and Z are all equidistant from each other. X has a charge of +1.0 μC, Y has a charge of +2.0 μC, and Z has a small negative charge.
   (a) Draw an arrow showing the force on charge Z.
   (b) The charge on Z changes to a small positive charge. Draw an arrow showing the force on it.

7. A positive test charge of 8.0×10^{-5} C is placed in an electric field of 50.0 N/C. What is the strength of the force exerted on the test charge?

8. Electrons are accelerated by a constant electric field of 1.0×10^{5} N/C. Calculate
   (a) the force on an electron.
   (b) the acceleration of an electron.

9. A drop is falling in a Millikan oil drop apparatus when the electric field is on.
   (a) Draw a free body diagram showing the forces acting on the oil drop.
   (b) If the drop is falling at a constant velocity, what can be said about the forces acting on it?

10. An oil drop weighing 1.9×10^{-15} N is suspended in an electric field of 6.0×10^{3} N/C.
    (a) What is the charge on the drop?
    (b) How many excess electrons does it carry?

11. A positively charged oil drop has a weight of 6.4×10^{-13} N. An electric field of 4.0×10^{6} N/C suspends the drop.
    (a) What is the charge on the drop?
    (b) How many electron is the drop missing?

12. If three more electrons were removed from the drop in problem 11, what electric field strength would be needed to suspend the drop?

13. A negative charge of 2.0×10^{-8} C experiences a force of 0.060 N to the right in an electric field. What is the field magnitude and direction?

14. A positive test charge of 5.0×10^{-4} C is in an electric field that exerts a force of 2.5×10^{-4} N on it. What is the magnitude of the electric field at the location of the test charge?

15. There is an electric field of 500 N/C in the +x direction in a certain region of space. A proton moving in this same region in the –x direction has an initial velocity of 4×10^{5} m/s. Calculate the velocity of the proton after it has traveled 40 cm?

Numerical Answers

1. 2.0×10^{4} N/C
2. 7.0×10^{-5} C
3. 4.4×10^{-7} C
4. (b) 2.4×10^{-17} N down
   (c) 1.64×10^{-26} N down
7. 0.004 N
8. (a) 1.6×10^{-14} N
   (b) 1.76×10^{16} m/s^2
10. (a) 3.17×10^{-19} C
    (b) 2
11. (a) 1.6×10^{-19} C
    (b) 1
12. 1.0×10^{6} N/C
13. 3.0×10^{6} N/C left
14. 0.50 N/C
15. 3.5×10^{5} m/s