Module 14 Physics

Assignment #1 Read pages 457 - 468.

1. What units are used to measure electric potential?
2. What units are used to measure potential energy?
3. Is potential difference the same as potential energy?
4. Calculate the electric potential for a +6.0 mC charge at the following distances:
   a. Radius = 0.2 meters
   b. Radius = 0.5 meters
   c. Radius = 2 meters
5. How does electric potential change the farther you get away from a charged particle?
6. Calculate the electric potential at a radius of 0.5 meters for the following charges:
   a. Charge = + 4.0 mC
   b. Charge = + 8.0 mC
   c. Charge = - 4.0 mC
7. How does the voltage change when you use a particle that has a larger charge?
8. Find the potential energy of a -0.9 mC particle that is placed in an electric field where the voltage is -12.0 volts.
9. A stationary -3.2 mC sphere is creating an electric field.
   a. Find the electric potential of the field 0.4 meter from the sphere.
   b. If you place a +1.1 mC particle 0.4 meter from the stationary sphere, what is the potential energy of the particle?
10. A stationary piece of metal with a +7.0 mC charge is creating an electric field.
    a. Find the electric potential of the field 0.2 meter from the piece of metal.
    b. You place a +1.3 mC particle 0.2 meters from the metal and hold it in place. What is its potential energy?
    c. The particle has a mass of 4.1 kg. Since you are holding the particle in place, it is not moving (velocity = 0 m/s). What is the kinetic energy of the particle when you are holding it?
    d. You let the particle go and it moves 1.8 meters from the piece of metal. Find the change in the particle's potential energy.
    e. All the potential energy that was lost was converted to kinetic energy. Use this value to find the speed of the particle at 1.8 meters from the piece of metal.
11. Honors: A -12.9 mC charged particle (mass = 2.88 kg) is placed 0.72 meters from a stationary +2.6 mC particle. If the particle starts at rest, how fast will it be moving after it has traveled 0.15 meters?
12. Honors: A +4.1 mC particle (mass = 3.5 kg) is shot with an initial velocity of 215 m/s towards a +1.5 mC stationary charge. If the particle starts out 1 meter away from the stationary charge, how close will it come to the charge before stopping and moving away?

Module 14 Physics

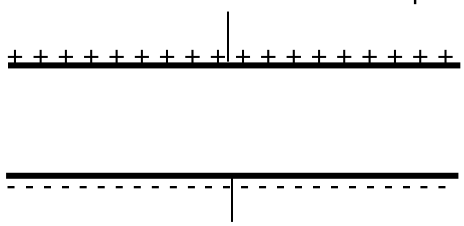
Assignment #2 Read pages 469 - 477.

13. What does a capacitor do?

14. Give two examples of electronic devices that use capacitors.

15. Parallel-plate capacitors are usually drawn with nothing but air between the plates, but they are actually made with a dielectric separating the plates. What is a dielectric?

16. Draw the electric field lines for the capacitor below:

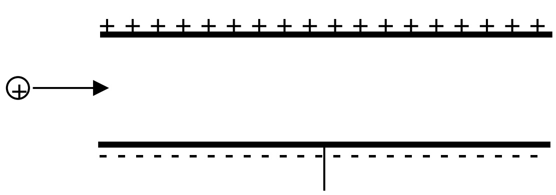


17. What units are used to measure capacitance?

18. A 3.5×10^{-6} farad capacitor is charged until there is 5.7 mC of total charge on its positive plate. What is the electric potential of the capacitor?

19. A capacitor stores 0.5 mC of charge and produces 1.3 V of electric potential. What is the capacitance of the device?

20. A positively charged particle is shot between the plates of a capacitor. Draw the path of the particle as it travels between the plates.



21. A negatively charged particle moves from the negative plate to the positive plate of a capacitor.

    a. Is its change in electric potential positive or negative?

    b. Does its potential energy increase or decrease?

22. Honors: An electron (mass = 9.1 x 10 -31 kg, q = -1.6 x 10 -19 C) moves from the negative plate to the positive plate of a 4.2 x 10 -6 F capacitor that is storing 15 mC of charge. How fast will the electron be moving when it reaches the positive plate of the capacitor?