HW #9 additional Problems

1. If a metal object receives a positive charge, does its mass increase, decrease, or stay the same? What happens to its mass if the object receives a negative charge? Include diagrams to support your answer.

2. A 27-g piece of aluminum that was originally electrically neutral is given a charge of +1.6 μC. (a) How many electrons were removed from the aluminum in the charging process? (b) What fraction of the electrons originally in the aluminum were involved in the charging process?
   a. 1×10^{13}, b. 1.3×10^{-12}

3. An electron is released a short distance above the surface of the Earth. A second electron directly below it exerts an electrostatic fore on the first electron just great enough to cancel the gravitational force on it. How far below the first electron is the second? Compare this to a known distance such as "it's about as far as the length of my hand."
   5.08 m

4. A 2.2×10^{-9} C charge is on the x axis at x = -1.5 m and a 5.4×10^{-9} C charge is on the x axis at x = 2.0 m. Find the net force exerted on a 3. 5×10^{-9} C charge located at the origin.
   -1.1×10^{-8} N

5. A piece of aluminum foil of mass 5.00×10^{-2} kg is suspended by a string in an electric field directed vertically upward. If the charge on the foil is 3.00 μC, find the strength of the field that will reduce the tension in the string to zero.
   1.63×10^{5} N/C