NAME: Solution	Quiz #3: Phys142

Two charged particles, q1 = 5 nC and q2 = -10 nC , are separated by d=1 mm. (Note that ke = 9 x 10^9 Nm^2/C^2, the value of the constant found in Coulomb's law where the force between two charges is F=ke (q1 q2 / r^2), and 1 nC = 10^{-9} C)

(a) (5 pts) What is the potential energy of the pair of charges? Explain the significance of the algebraic sign of your answer.

$$U = \frac{k q_1 q_2}{d} = \frac{(8.99\times10^9\ N\cdot m^2/C^2)(5\times10^{-9}\ C)(-10\times10^{-9}\ C)}{0.001\ m}$$

$$U = -4.50\times10^{-4}\ J$$

(-) sign means force is required to hold them apart, and work would be required to separate them further.

(b) (5 pts) What is the electric potential at a point midway between the charged particles?

$$V_1 = \frac{kq_1}{(d/2)} \quad ; \quad V_2 = \frac{kq_2}{(d/2)}$$

$$V_p = \frac{2k}{d}(q_1 + q_2)$$

$$= \frac{2(8.99\times10^9)}{0.001m}(5 - 10)\times10^{-9}\ C$$

$$V_p = -89.9\ kV$$