Problem Session
Electric Force

1. An isolated system of four point charges is distributed as follows

	Charge	**Location**
q_1	-10 μC	(0,-6) m
q_2	+8 μc	(8,-3) m
q_3	-12 μC	(-6,2) m
q_4	+14 μC	(8,6) m

   a) What is the resultant electric force acting on q_3?

2. A proton is at the origin and an electron is at the point x = 0.41 nm, y = 0.36 nm. Find the electric force on the proton.

3. A charge $3q$ is at the origin, and a charge $-2q$ is on the positive x axis at $x = a$. Where would you place a third charge so it would experience no net electric force?

4. Two identical small conducting spheres initially carry charges q_1 and q_2. When they are 1.0 m apart, they experience a 2.5-N attractive force. Then they are brought into contact so charge moves from from one to the other until they have the same net charge. They are again placed 1.0 m apart, and now they repel with a 2.5 N force. What were the original values of q_1 and q_2?

Answers

1. a) 0.01 N at 66.4˚

2. The magnitude of the force is 7.74×10^{-10} N at an angle $\theta = 41.3^\circ$ to the x axis.

3. $x = 5.45a$

4. The solutions are $q_1 = \pm 40.2$ μC and $q_2 = \mp 6.90$ μC, or the same values with q_1 and q_2 interchanged.