SP212 Quiz 1

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Questions 1-2 concern the following scenario: Two charged particles sit on the x-axis of a coordinate system and are separated by a distance \( L = 2.00 \text{ cm} \). Particle 1 has charge \( q_1 = 4.50 \mu \text{C} \) and particle 2 has charge \( q_2 = -2.50 \mu \text{C} \) (\( 1 \mu \text{C} = 10^{-6} \text{ C} \)).

![Diagram showing two charged particles on the x-axis with distance L between them.]

1) What is the electrostatic force that particle 1 exerts on particle 2?
   a) \((125 \text{ N}) \hat{i}\)
   b) \((-125 \text{ N}) \hat{i}\)
   c) \((184 \text{ N}) \hat{i}\)
   d) \((-184 \text{ N}) \hat{i}\)
   e) \((253 \text{ N}) \hat{i}\)
   f) \((-253 \text{ N}) \hat{i}\)

2) How many excess electrons does particle 2 have?
   a) \(1.23 \times 10^{13}\)
   b) \(1.56 \times 10^{13}\)
   c) \(1.61 \times 10^{13}\)
   d) \(1.68 \times 10^{13}\)
   e) \(1.90 \times 10^{13}\)

3) Initially, sphere A has a charge of \(-40 \text{ nC}\) and sphere B has a charge of \(+10 \text{ nC}\) (\(1 \text{ nC} = 10^{-9} \text{ C}\)). The spheres are conductors and are identical in size. If the spheres touch, what is the resulting charge on sphere A?
   a) \(-30 \text{ nC}\)
   b) \(-15 \text{ nC}\)
   c) \(0 \text{ nC}\)
   d) \(15 \text{ nC}\)
   e) \(30 \text{ nC}\)

   \[ q_2 = -2.50 \times 10^{-6} \text{ C} \cdot \frac{1 \text{ e}^-}{-1.602 \times 10^{-19} \text{ C}} = 1.56 \times 10^{13} \]

   \( (1 \text{ e}^- = -1.602 \times 10^{-19} \text{ C}) \)

   Total charge = \(-40 \text{ nC} + 10 \text{ nC} = -30 \text{ nC}\),
   this is distributed evenly between the spheres!

   \[ q_A = \frac{-30 \text{ nC}}{2} = -15 \text{ nC} \]