Physics 203 Ecampus
Individual Quizbit | Charges and Forces

Timed Quizbit | Work individually to produce a handwritten solution on paper or a tablet to **questions 1** of this Quizbit during the timed 30-minute Gradescope assignment **Timed Quizbit**. The quality of your solution and communication is far more important than the final answer!

1. Two small charged spheres are arranged as shown, placed against friction-less surfaces. Each sphere has a charge of **+2.35 μC** and a mass of **5.62 g**.

   (a) What is the distance between the two charges?
   (b) What is the magnitude of the electric force on the bottom charge?
   (c) The bottom charge is allowed to move. Using a standard coordinate system, find the initial acceleration **vector** of the charge. (Hint: draw a FBD!!!)
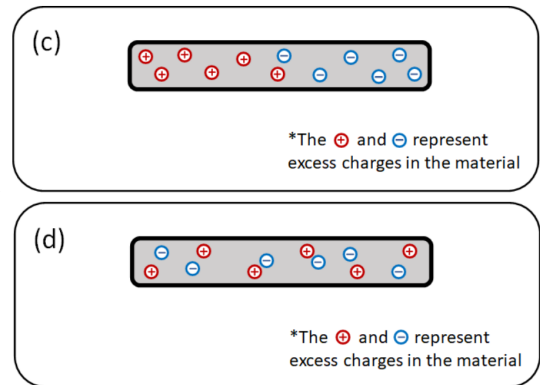
Hints:

$$\left|\vec{F}^E\right| = k\,\frac{|q_1||q_2|}{|\Delta\vec{r}|^2}$$

$$k = 8.99 \times 10^9 N\frac{m^2}{C^2}$$

$$\mathbf{C^2 = A^2 + B^2}$$

2 cm

4 cm
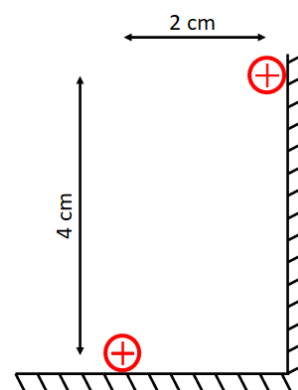
Final Solution and Sensemaking | After you've completed and submitted question 1 to the timed Gradescope assignment, take more time to create a final solution set to all the questions. Use any of the course support systems (LAHHH, Teams, WormHole, … etc.) to produce the best solutions. Submit your work to the **Final Solution** Gradescope assignment by Sunday. Your final work will be graded on both completeness and correctness. For questions 2 - 4, there are 4 correct answers and only the first 4 answers will be accepted to prevent someone from selecting all answers.

2. You start with two identical neutral, conducting, spheres labeled A and B. Sphere A always stays to the left of sphere B. Which of the following procedures results in a negatively charged sphere B?

   ☐ (a) Touch both spheres together. Bring a positive rod close (no touching!) to the left side of sphere A. Pull the two spheres apart.
   ☐ (b) Touch both spheres together. Bring a negative rod close (no touching!) to the left side of sphere A. Pull the two spheres apart.
   ☐ (c) Touch both spheres together. Touch a positively charged conducting rod to sphere A. Pull the two spheres apart.
   ☐ (d) Touch both spheres together. Touch a positively charged insulating rod to sphere A. Pull the two spheres apart.
   ☐ (e) It is not possible to get a negatively charged sphere B unless both spheres are insulating spheres.

3. Which of the following written descriptions and/or pictures represent a polarized system?

☐ (a) A PVC (polyvinyl chloride) pipe has excess electrons uniformly distributed on it after being rubbed against fur. The PVC pipe is far from other objects.

☐ (b) A net neutral wooden board when a charged PVC (polyvinyl chloride) pipe is placed near, but does not touch, the wooden board.

☐ (c) Image (c).

☐ (d) Image (d).

(c)

*The ⊕ and ⊖ represent excess charges in the material

(d)

*The ⊕ and ⊖ represent excess charges in the material

4. Which of the following statements are true about a scenario where you get an electrostatic shock from a metal object?

☐ (a) Protons transfer between you and the metal, resulting in the shock.

☐ (b) Neutrons transfer between you and the metal, resulting in the shock.

☐ (c) Electrons transfer between you and the metal, resulting in the shock.

☐ (d) Speed force particles transfer between you and the metal, resulting in the shock and probably superpowers too.