

Quantitative Problems (Given, Find, Solution REQUIRED)
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1. What must be the distance between point charge $q_1 = 30.0 \text{ } [\mu\text{C}]$ and point charge $q_2 = -53.0 \text{ } [\mu\text{C}]$ for the electrostatic force between them to have a magnitude of $5.70 \text{ } [\text{N}]$? The metric prefix “ μ ” means “micro” or $\times 10^{-6}$ (millionth)

2. Two positrons (charge $1.6 \times 10^{-19} \text{ } [\text{C}]$) are $0.01 \text{ } [\text{m}]$ apart.
 - a. What is the electric force acting on them?
 - b. If these positrons were held in place and then released, what acceleration would they experience at the instant they were released? The mass of a positron is $1.67 \times 10^{-27} \text{ } [\text{kg}]$.

Qualitative Problems Short answer (in a complete sentence) or a fully labeled graph (Given, Find, Solution NOT required)

3. Draw a schematic diagram of a three-bulb series circuit. Full credit will be earned for schematic diagrams that include the following:
 - a. All circuit elements are labeled (V for batteries and R_1, R_2 , etc. for light bulbs)
 - b. Diagrams whose wires (lines) are perpendicular and parallel.
 - c. Standard symbols are used for electrical circuit elements.

4. Draw a schematic diagram of a three-bulb parallel circuit.
 - a. All circuit elements are labeled (V for batteries and R_1, R_2 , etc. for light bulbs)
 - b. Diagrams whose wires (lines) are perpendicular and parallel.
 - c. Standard symbols are used for electrical circuit elements.

5. Consider using a hand generator to light up a three-bulb SERIES circuit and a three-bulb PARALLEL circuit. Which circuit will require more energy to light up the bulbs to the same brightness?

6. Given the same number of bulbs, what is the advantage of using a parallel circuit configuration vs. a series circuit configuration?

7. **What subatomic particles are the charge carriers in an electrical circuit? Draw a cross-section of a wire and illustrate the process of electrical current flow.**

8. **Draw the “Energy Buckets” for a person lighting a bulb using a hand-generator. Include the person, the generator, and light bulb in your bucket model.**

9. **Electrical energy can be transformed into:**
 - a. **light**
 - b. **heat**
 - c. **sound**
 - d. **motion (kinetic energy)**
 - e. **all of the above and more**

10. **What is the name of the device that is used to convert electrical energy into mechanical energy?**

11. **What is the name of the device that is used to convert mechanical energy into electrical energy?**

12. **Recall burning the steel wool with the hand generator. The steel wool is similar to which electrical device in your home?**

HW Set 2 Answers

1. 1.58 [m]

2a. 2.30×10^{-24} [N]

2b. 1379.64 [m/s²]

3-12. Will discuss in class