

PHYSICS 1020

Homework #4

(Due April 1, 2019)

1. What is the force between two charges of charge $+22 \text{ pC}$ and -50 pC separated by a distance of 7.0 cm ? Is the force attractive or repulsive?
2. (KJF 20-19) What are the strength and direction of the electric field 2.0 cm from a small glass bead that has been charged to $+6.0 \text{ nC}$?
3. (KJF 20-27) What are the strength and direction of an electric field that will balance the weight of (a) a proton and (b) an electron?
4. Three electric charges are placed along the x -axis, as follows:
 - A charge of $+16 \text{ nC}$ is placed at $x = -8 \text{ cm}$
 - A charge of -20 nC is placed at $x = +4 \text{ cm}$
 - A charge of -10 nC is placed at $x = +10 \text{ cm}$

What are the magnitude and direction of the electric field at the origin?

5. (KJF 21-19)
 - a. What is the potential difference between the terminals of an ordinary AA or AAA battery? (If you're not sure, find one and look at the label.)
 - b. An AA battery is connected to a parallel-plate capacitor having 4.0-cm -diameter plates spaced 2 mm apart. How much charge does the battery move from one plate to the other?
6. You are given resistors of resistance $10.00 \text{ k}\Omega$, $25.00 \text{ k}\Omega$, $30.00 \text{ k}\Omega$, and $45.00 \text{ k}\Omega$. What is the equivalent resistance if these resistors are connected: (a) in series; (b) in parallel?
7. (KJF 22-29)
 - a. How long must a 0.60-mm -diameter copper wire be to carry a 0.50 A current when connected to the terminals of a 1.5 V flashlight battery?
 - b. What is the current if the wire is half this length?

8. (KJF 22-60) A wire is 2.3 m long and has a diameter of 0.38 mm. When connected to a 1.2 V battery, there is a current of 0.61 A. What material is the wire most likely made of?

9. What is the resistance of a 2.5-meter length of 22-gauge (AWG) solid copper wire at a temperature of 45°C?

10. You need a resistance of 50 k Ω , but you don't happen to have a 50 k Ω resistor. You do have a 75 k Ω resistor. What additional resistor do you need to produce a total resistance of 50 k Ω ? Should you join the two resistors in parallel or in series?