

PHY114 S09 Problem Set 4

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Feb 13 2009

Seven Problems Due Feb 23

1. A $+21\mu C$ point charge is placed 5.8 cm from an identical $+21\mu C$ point charge. How much work would be required by an external force to move a $+0.17\mu C$ test charge from a point midway between them to a point 1.5 cm closer to either of the charges?
2. An alpha particle (which is a helium nucleus, $Q = 2e$, $m = 6.67 \times 10^{-27} kg$) is emitted in a radioactive decay with kinetic energy 4.64 MeV. What is its speed?
3. A homemade capacitor is assembled by placing two 20 cm pie pans 8.0 cm apart and connecting them to the opposite terminals of a 9V battery. Find the capacitance, the charge on each plate and the electric field halfway between the plates.
4. Two capacitors, 7nF and 2 nF , are connected in series to a 9.00V battery. The capacitors are later disconnected from the battery and connected directly to each other, positive plate to positive plate, and negative plate to negative plate. What will be the potential difference across each capacitor? What will be the charge on each capacitor?
5. A 12-V battery causes a current of 0.70A through a resistor. What is its resistance? How many joules of energy does the battery lose in a minute?
6. An extension cord made of copper wire of diameter 0.129cm (no. 16 copper wire) and of length 1.5m (5ft) is connected to an electric heater which draws 14.0A on a 120V line. How much power is dissipated in the chord? Look up the resistivity of Copper.
7. Two $3.9\mu F$ capacitors, two $2.5k\Omega$ resistors, and a 12.6V source are connected in series. Starting from the uncharged state, how long does it take for the current to drop from its initial value to 1.00 mA ?