Group Members

UNIVERSITY OF ALABAMA
Department of Physics and Astronomy

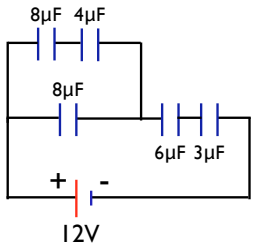
PH 106 / LeClair Fall 2008

Exercise: Electrical Energy & Capacitance

Instructions:

- Answer all questions below. Show your work for full credit.
- You may collaborate, turn in one copy per group

1. Find the equivalent capacitance of the capacitors in the figure below.



2. A parallel-plate capacitor has $4.00\,\text{cm}^2$ plates separated by $6.00\,\text{mm}$ of air. If a $12.0\,\text{V}$ battery is connected to this capacitor, how much energy does it store in Joules? In electron volts?

3. A potential difference of $100\,\text{mV}$ exists between the outer and inner surfaces of a cell membrane. The inner surface is negative relative to the outer. How much work is required to move a sodium ion Na^+ outside the cell from the interior? Answer in electron volts and Joules. A singly-charged ion has a charge of $1e$, $1\,\text{eV} = 1.6 \times 10^{-19}\,\text{J}$.

4. A point charge q is a distance x above an infinite conducting plate. Given that the electric field above the plate must be $4\pi k_e \sigma$, calculate the surface charge density as a function of the position on the plate.