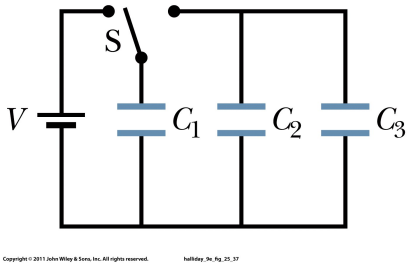
IN CLASS PROBLEMS

Problems:

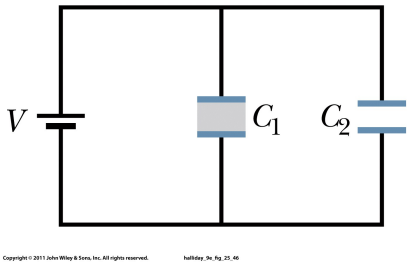
- 25-22
- 25-46
- 26-46
- 26-64
- 27-19
- 28-46

Note: The final answers can be found at the end of this document. It is important that students understand the material presented on the blackboard by the TAs as well as the problems specified here.

25-22. In the figure below, $V = 10$ V, $C_1 = 10$ μF, and $C_2 = C_3 = 20$ μF. Switch S is first thrown to the left side until capacitor 1 reaches equilibrium. Then the switch is thrown to the right. When equilibrium is again reached, how much charge is on capacitor 1?



25-46. In the figure below, how much charge is stored on the parallel-plate capacitors by the 12.0 V battery? One is filled with air, and the other is filled with a dielectric for which $\kappa = 3.00$; both capacitors have a plate area of 5.00×10^{-3} m^2 and a plate separation of 2.00 mm.



26-46. A copper wire of cross-sectional area 2.00×10^{-6} m^2 and length 4.00 m has a current of 2.00 A uniformly distributed across that area. Copper has a resistivity of $\rho = 1.69 \times 10^{-8}$ $\Omega \cdot$ m.

a) What is the magnitude of the electric field along the wire?
b) How much electrical energy is transferred to thermal energy in 30 min?

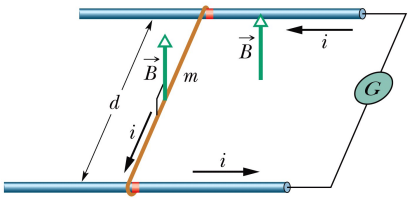
26-64. A cylindrical resistor of radius 5.0 mm and length 2.0 cm is made of material that has resistivity of 3.5×10^{-5} $\Omega \cdot$ m. What are:

a) the magnitude of the current density when the energy dissipation rate in the resistor is 1.0 W?
b) the potential difference when the energy dissipation rate in the resistor is 1.0 W?

27-19. A total resistance of 3.00Ω is to be produced by connection an unknown resistance to a 12.0Ω resistance. (a) What must be the value of the unknown resistance, and (b) should it be connected in series or in parallel?

28-46. In the figure below, a metal wire of mass $m = 24.1$ mg can slide with negligible friction on two horizontal parallel rails separated by distance $d = 2.56$ cm. The track lies in a vertical uniform magnetic field of magnitude 56.3 mT. At time $t = 0$, device G is connected to the rails, producing a constant current $i = 9.13$ mA in the wire and rails (even as the wire moves). Ignore the induced current arising from the change in flux in the wire loop as the wire moves. At $t = 61.1$ ms, what is the wire's:

a) speed
b) direction of motion (left or right)



IN CLASS PROBLEMS

Answers:

- 25-22: 20μC
- 25-46: 1.06 nC
- 26-46:

a) 1.69×10^{-2} V/m
b) 0.135 W
c) 243 J

- 26-64:

a) 1.3×10^{5} A/m^2
b) 9.4×10^{-2} V

- 27-19:

a) 4.00Ω
b) It must be in parallel.

- 28-46:

a) 3.34 cm/s
b) The wire moves left.