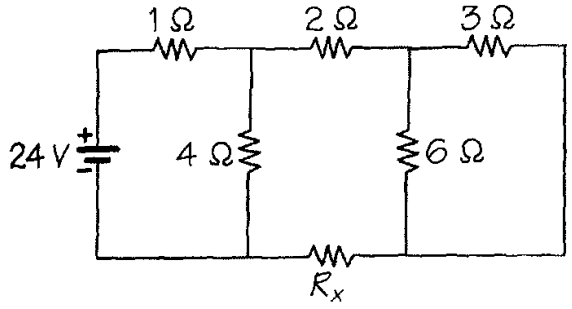
Week 2 (Beginning Sept 13)

Prob2749: If you treat electrons as a gas of independent particles, at what temperatures would an average electron have sufficient energy to cross the energy gap for silicon (1.1 eV), germanium (0.7 ev), and carbon (6 eV) ?

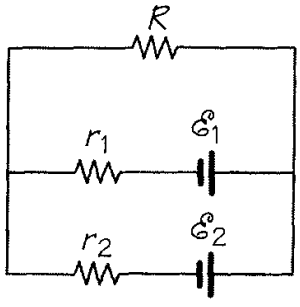
Prob2806. A flashlight battery with an internal resistance of 0.25 Ω produces a 320-mA current through a I8.5 Ω resistor. What is the emf of the battery? What is the terminal voltage of the battery in this usage?

Prob2817.A flashlight consists of two 1.5-V batteries connected in series to a bulb with resistance 10 Ω. (a) What is the power delivered to the bulb? (b) Batteries run down when they acquire an (internal) resistance. How large is the additional resistance if the power delivered to the bulb has decreased by one-third of its initial value?

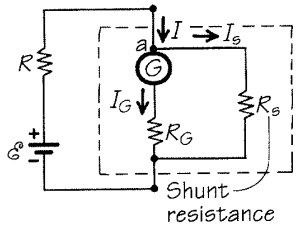
Prob2834: Consider the circuit shown below. Calculate the current and the power dissipated in the 4 Ω resistor as a function of the unknown resistance R_X.



Prob2837: Two batteries are connected in parallel as in Figure below and supply current to a load resistor of 5 Ω. One of the batteries is freshly charged, with an emf of ε_1 = 12 V and an internal resistance of r_1 = 0.1 Ω. The other one is almost dead, with an emf of ε_2 = 10 V and an internal resistance of r_2 = IO Ω. What is the current through the load resistor? How much of this current is supplied by each of the batteries?



Prob2847: Suppose that the current to be measured by an ammeter is so large that a galvanometer deflected by the current would be pinned at its maximum reading. This problem can be resolved by the use of a shunt resistor (see figure). Show with the shunt resistor (resistance Rs) present, the current I is given in terms of a reduced current I_G flowing through the galvanometer by the formula I = IG[1 + (RG/Rs), where RG is the resistance of the galvanometer. Thus, a reading of the reduced current IG allows us to determine the current I.



Prob2859: Calculate the current in the battery as a function of time for the circuit shown in the figure below if the switch S is closed at time t=0.