Problem 1 (15 pts). Four identical light-bulbs are connected to a voltage source, as shown. If bulb one is observed to emit $P_1 = 1$ watt of power in the form of light, how much power is emitted by bulbs 2, 3 and 4? That is, what are $P_2$, $P_3$ and $P_4$?
Problem 2 (15 pts). A battery is connected to a load of resistance $R$ at time $= 0$. The current is observed to begin at a value $i_0$ and then to decrease as shown below. How much total energy and charge were delivered to the load? Show your work including any fundamental relations you are using (don’t just write down the answer).
Problem 3 A (10 pts): Use the equivalence principal to reduce the left circuit to the right one, that is, find $R_{eq}$. Do any required algebra to simplify the result.

Problem 3 B (5 pts): CIRCLE ONE: Identical currents are driven into both circuits. The voltage measured across each set of terminals is the
a) The same
b) Different
c) There is not enough information to say

Problem 3 C (5 pts): CIRCLE ONE: Identical voltages are connected across both circuits. The power dissipated in the various resistors has which of the following relationships:
a) Each resistor in the original circuit dissipates less power than the power dissipated in $R_{eq}$.
b) Some of the resistors in the original circuit dissipate less and some more than the power dissipated in $R_{eq}$.
c) Each resistor in the original circuit dissipates more power than the power dissipated in $R_{eq}$.
d) There is insufficient information to determine this relationship.
Problem 4 (30 pts): Using the partially-labeled circuit below, set up the complete node voltage solution in its final form. Do not solve the equations, but write equations that, if given the resistor and voltage source values, would be ready for numerical solution.
Problem 5 (20 pts): Draw the $iv$ relationship for the pictured components. Label as much of the graph as you can with relevant quantities.

Switch. Draw and label $iv$ curves for both open and closed cases.

Did you put your name on all the pages?