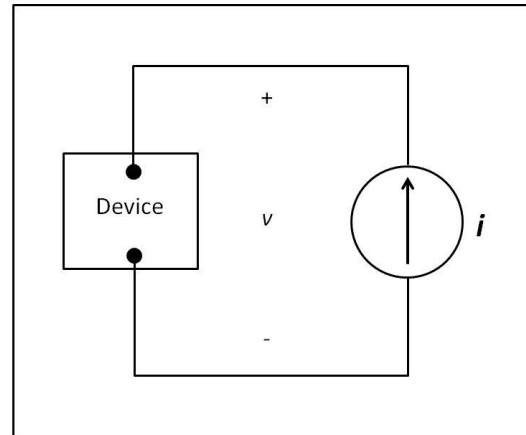


BEE 215 Winter 2024 Homework assignment #1,

Due on Thursday, January 18th, at the beginning of class

1- A variety of current source values were applied to the unknown device shown in the figure below. The power absorbed by the device for each value of current is recorded in the table at the right. Use the values in the table to construct a circuit model for the device consisting of a single resistor.

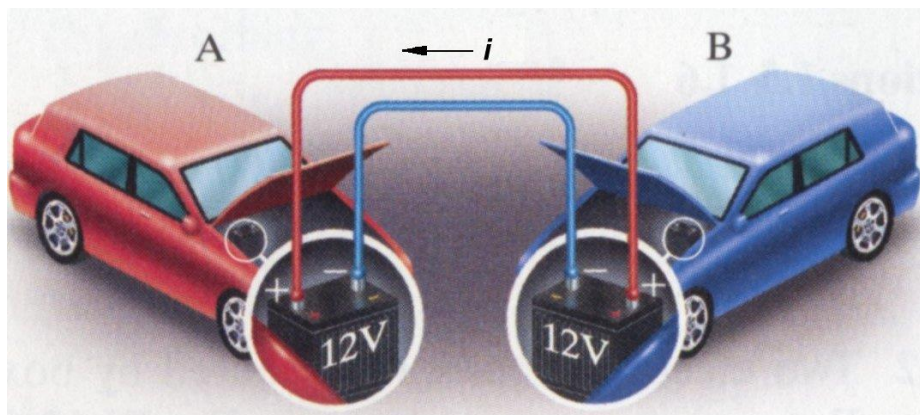
i (Amperes)	p (Watts)
2	100
4	400
6	900
8	1600
10	2500
12	3600



2- When a car battery is "dead", it can often be started by connecting the battery terminals of the dead battery to the terminals of another car. The positive terminals are connected together, as are the negative terminals, as shown in the figure below. Note: DO NOT TRY THIS FOR REAL UNLESS YOU KNOW WHAT YOU ARE DOING! Assume that the current, i , is measured to be 30 A.

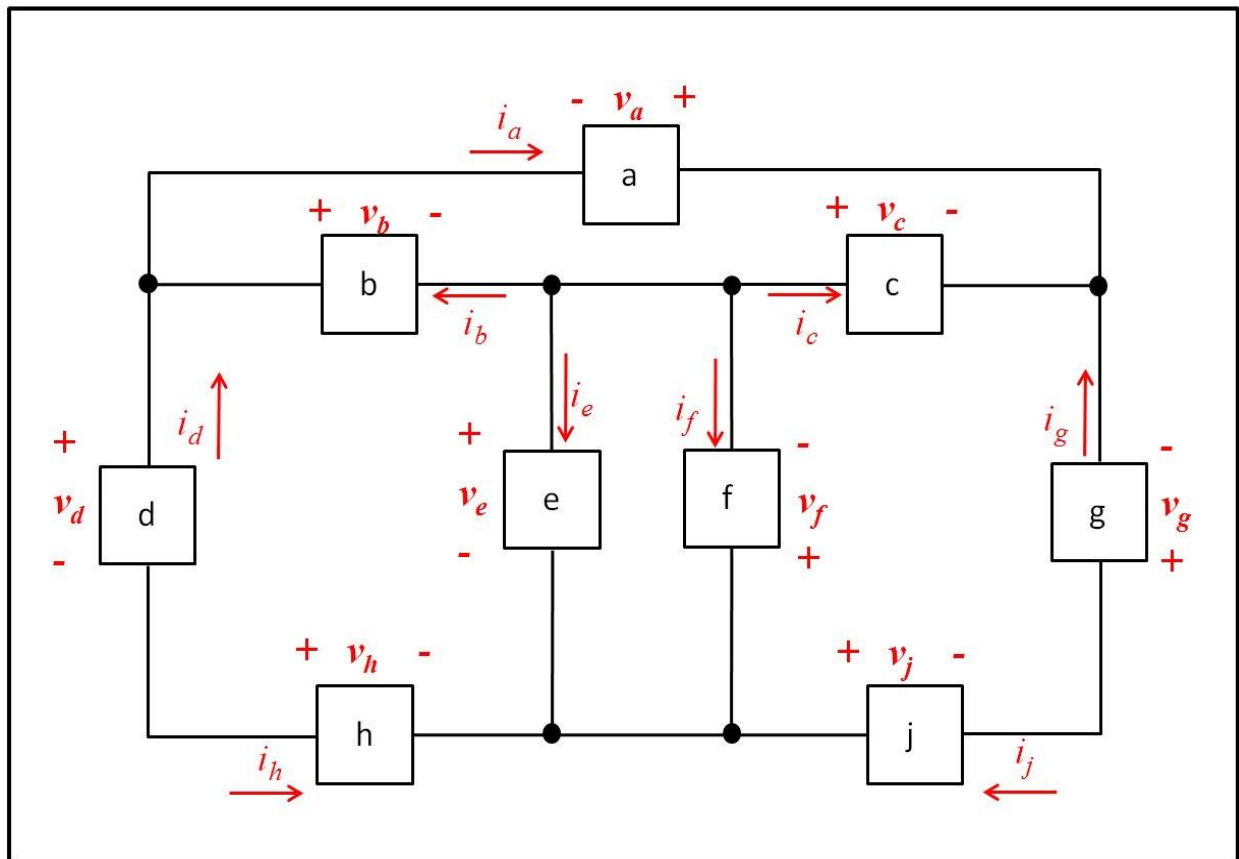
a- Which car has the dead battery?

b- If the connection is maintained for 1 minute, how much energy is transferred to the dead battery?



3- One method of checking calculations involving interconnected circuit elements is to see that the total power delivered equals the total power absorbed. In other words, energy is conserved. With this thought in mind, consider the circuit and table shown below. The table gives the values for v_a through v_j and i_a through i_j , respectively.

State whether the values given satisfies the power check. You must show your results for each element in order to support your conclusion.



Element	Voltage (V)	Current (mA)
a	1.6	80
b	2.6	60
c	-4.2	-50
d	1.2	20
e	1.8	30
f	-1.8	-40
g	-3.6	-30
h	3.2	-20
j	-2.4	30

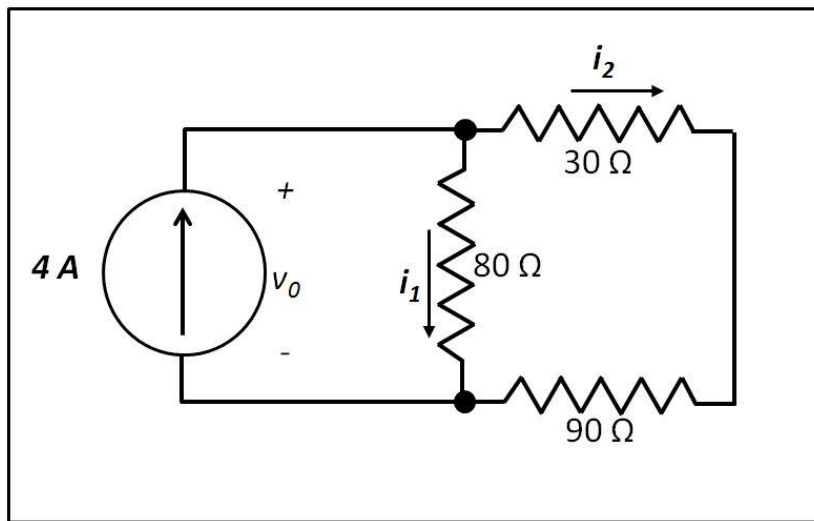
4- A current of 1200 A exists in a thick copper wire, with a circular cross-section (radius = 1.5 mm). The current is due to free electrons moving through the wire at an average velocity of "v" meters per second. If the concentration of free electrons is 10^{29} electrons per cubic meter and they are uniformly distributed through the wire, then what is the average velocity of an electron?

The next two problems are designed to help you get started with LTspice. You definitely should not get these problems wrong! For problem #6, you should consult the LTspice Information Page on the course Canvas site. Check out the link, "How to create dependent sources in LTspice."

5- (a) Find the currents i_1 and i_2 in the circuit shown below.

(b) Find the voltage v_0 .

(c) Verify that the total power developed equals the total power dissipated.



6- (a) Find the voltage, v_y , in the circuit shown below.

(b) Show that the total power generated in the circuit equals the total power absorbed in the circuit.

