READINGS: Electronics Workbook 1 (**ew1.pdf**): Pages 28-65
Man of High Fidelity (**armstrong.pdf**): Chapters 4-6

This assignment is due at the beginning of the next class. There will be a one question quiz on this homework ONE WEEK after the homework is reviewed.

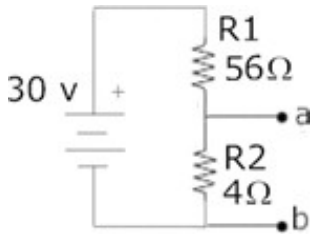
1. Armstrong Reading Questions

1.***A1)*** What was Armstrong's Mother's maiden name?

2.A2) By 1917, What circuit was Armstrong receiving invention royalties of about $500/month (same buying power as $10,350/month today!) for?

2. Voltage Dividers

2.B1) Find $\mathbf{V_{ab}}$, the voltage across $\mathbf{R_2}$ from **a** to **b**, in Figure 2.1, *on the right*, using the voltage divider equation.



Compare HW#2 Figure 1 to HW#1 Figure 4 until it is clear to you why the answer to HW#1.4b must be the same as the answer to HW#2.1 here.

2.B2a) Find the ***current* I** leaving the **30V source** in Figure 2, *on the right*.

(Hint-start by combining the two **20 ohm** resistors).

2.B2b) Find the voltage $\mathbf{V_{ab}}$ from **a** to **b** (across $\mathbf{R_3}$).

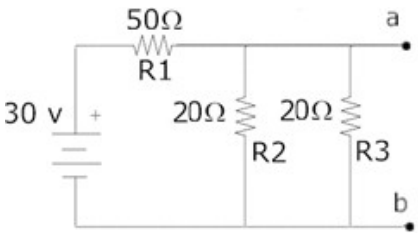


Figure 2.2 Series/Parallel Voltage Divider Circuit

2.*B3)* Using the voltage divider equation find the voltage $\mathbf{V_{ab}}$ from **a** to **b** (across $\mathbf{R_2}$) in Figure 3.

Then examine and compare Figures 2 and 3 until it is clear to you why the answer to #2b must be the same as the answer to #3.

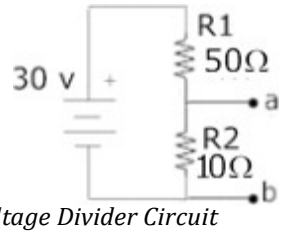


Figure 2.3 Voltage Divider Circuit

3. Power Dissipation in Resistors

(NOTE: 1 mA = 0.001 Amp)

2.B4) Find the power dissipated in a **130 ohm** resistor carrying **60mA**

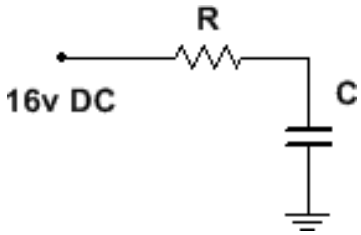
2.B5a) Find the power dissipated in a **100 ohm** resistor carrying **60 mA**.

2.B5b) Is the calculated power level for the 100 ohm resistor within the ratings of a **1/2 watt** resistor? (Yes, No)

Note: This question presumes the resistor is in an open, well-ventilated, space. If a resistor is used in an enclosed space, e.g. inside a small box, it is good practice not to exceed 50% of the stated power rating.

4. Charging Capacitors

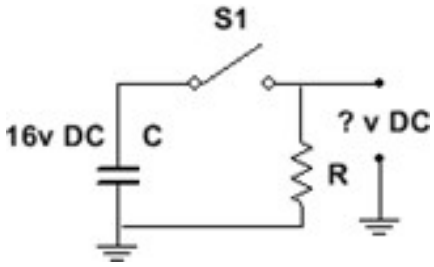
4.a. Consider a capacitor being charged through a resistor from a 16-volt source. (*presume the input voltage is exactly 16 volts*).



2.B6a) What is the *approximate* **theoretical** value of voltage across the capacitor after **one time constant**?

2.B6b) What is the *approximate* **theoretical** value of voltage across the capacitor after **5 time constants**?

4.b. If a capacitor is charged to exactly **16 volts** and is then **discharged** through a switch into a resistor.



2.B7a) What is the *approximate* voltage across the resistor, V_R, after **one time constant**?

2.B7b) What is the *approximate* voltage across the resistor, V_R, after **5 time constants**?

Figure 2.5 Capacitor as Voltage Source Circuit

5. Calculating Time Constants

2.B8) With a series resistor of **100KΩ,** what value of capacitance would be required to have a time constant of **1 minute?**

(*Due to current leakage in real electrolytic capacitors, the actual charging times will be slower. Ignore this effect and calculate an approximate, **ideal**, estimate of the time constant*.)

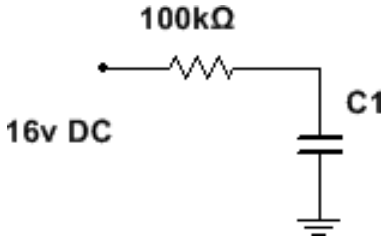


Figure 2.6 RC Time Constant Circuit