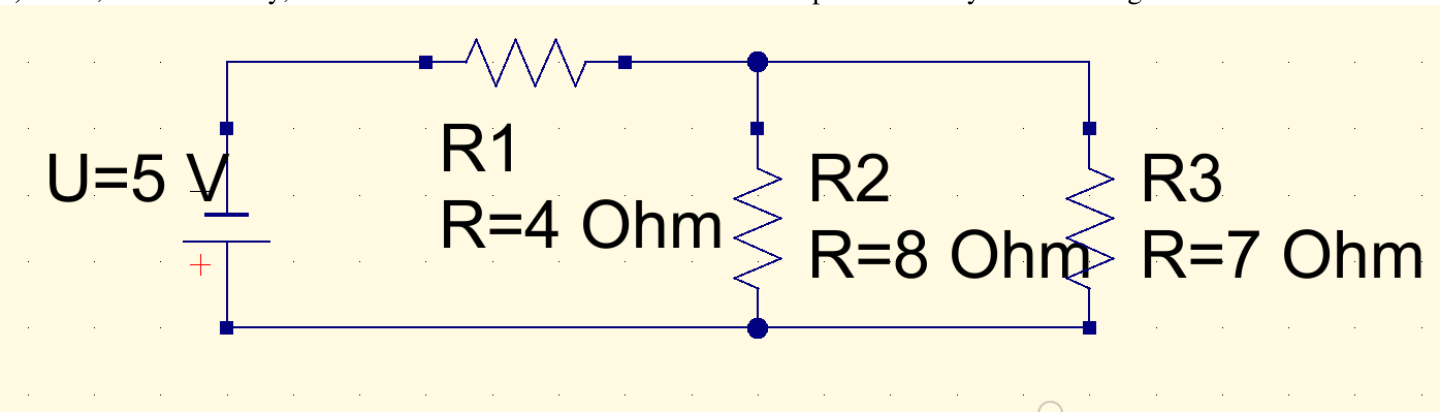
Physics 313 assignment for Thursday, Aug. 23
Topics: current/voltage/power, voltage dividers, Thévenin model, meters, kirchoff's rules

Problems to hand in:
1) a) In the figure below, which of the three resistors dissipates the most power (argue this without any exact calculations--just argue based on relative sizes or the resistances and how things are connected), and
b) Now, more carefully, determine how much does that resistor dissipates? Show your reasoning and include all work.

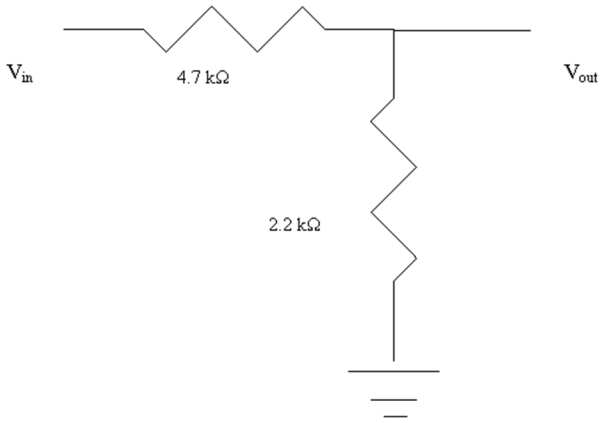


2) You want to use a voltmeter with an impedance of R_V and an ammeter with an impedance of R_A, along with a DC power supply of voltage V, to determine the resistance of a resistor (true value=R).

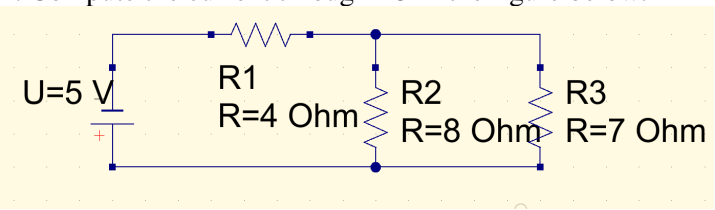
a) Sketch a circuit diagram for each of the two possible configurations you could use to make simultaneous measurements of voltage and current in order to try to find R.
b) For each of these configurations, derive an expression for the measured resistance—that is, use $R_m \equiv V_m/I_m$, where V_m is the measured voltage (which might not equal the power supply voltage V!) and I_m is the measured current. Your results for R_m should depend **only** on R, R_V , and R_A.
c) What percentage error in measuring R is made with each configuration if R_V = 10 R and R_A = 0 (ideal ammeter, not-so-ideal voltmeter)? What if R_V = Infinity and R_A = 0.1 R (ideal voltmeter, not-so-ideal ammeter)?

3) Consider the voltage divider circuit at right:

a) If V_{in}=15.00 V, what is V_{out}?
b) If a load of 1 kΩ is attached (from V_{out} to ground), what is the new V_{out}?



4. Compute the current through R3 in the figure below.



5. Concept questions:
a) In determining the Thévenin equivalent circuit, what quantity in the original circuit does V_{TH} refer to?
b) For an accurate measurement, should the input impedance of a voltmeter be much lower or much higher than the impedance of the resistor across which it is placed?
c) In the circuit in problem 4 above, is the R3 in parallel with R1? In series with R1? Some other kind of arrangement? How should you describe it?