CHEMISTRY 133
Spring, 2015 Homework Set 1
Only Problems in Bold are Submitted for Grading

Set 1.1 - Complete for quiz on Feb. 5

Statistics Calculations (See Chem. 133 Lab Manual pages 3-4):

1. Download the file on the Chem 133 website labeled HW11.txt. (this gives the time in minutes and the signal in fluorescence units) and transfer to an Excel File. Print a table from Excel showing two columns collected over the first 30 s period.

2. Make a plot of the raw data from above and also data processed with a 2 s moving average over both the first 30 s. This can be done by either using Excel's Plotting routines or by creating a 2 s moving average using a new column in Excel.

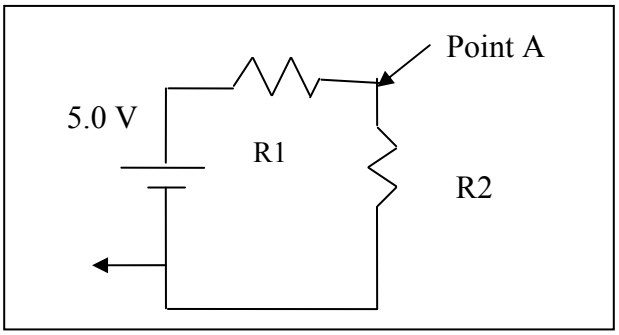
3. Given the following data, determine the concentration of levoglucosan in an unknown and the standard deviation in its concentration.

Calibration Data..... Unknown Data

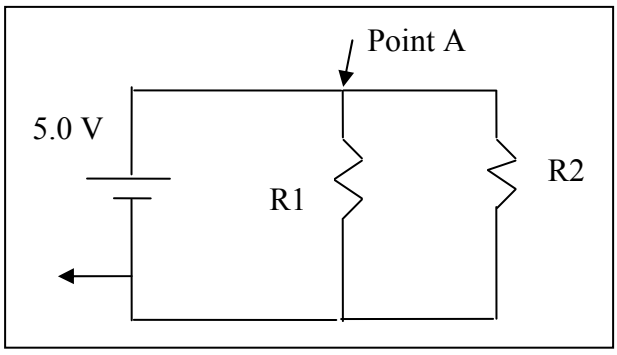
Levoglucosan conc (ug/mL)	Levoglucosan Area
0.5	469.11
1	826.57
2	1578.66
5	3973.85
10	8043.47

Levoglucosan conc (ug/mL)	Levoglucosan Area
Unknown	2276.40

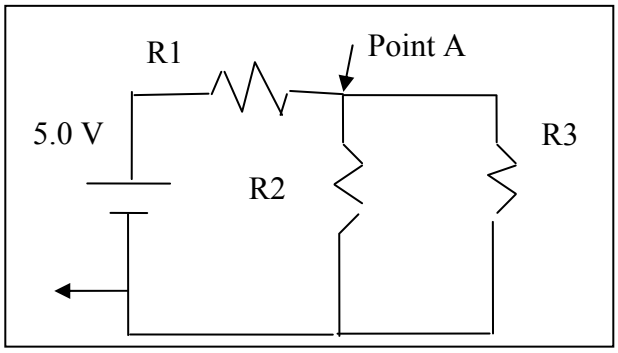
4. In the circuit to the right, with R1 = 250 Ω, R2 = 1250 Ω, calculate:
a) the voltage at point A (relative to ground).
b) the current through point A
c) the power dissipated in both resistors



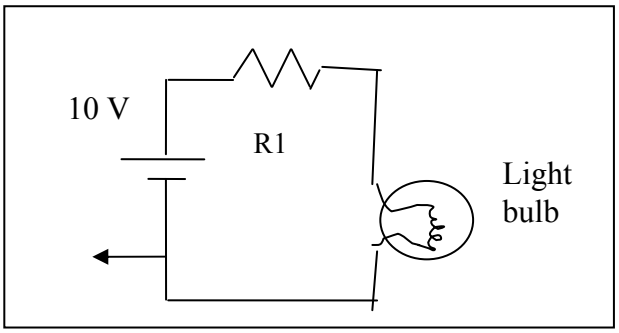
5. Given the following circuit to the right with R1 = 500 Ω, and R2 = 1000 Ω, determine:
a) the current through each resistor.
b) the power dissipated in each resistor.



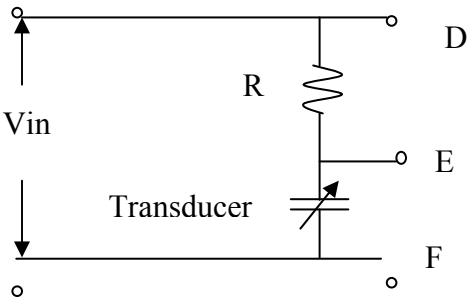
6. In the following circuit to the right with R1, R2, and R3 equal to 120, 240 and 180 Ω, respectively, calculate the voltage at point A and the current through R3.



7. Calculate the resistance of R1 in order to have 15 W of power supplied to the light bulb if the resistance of the light bulb is 3.4 Ω.



~~6.~~ 8. Some hygrometers, instruments that measure water
vapor, contain a capacitor with a material that absorbs water between the metal plates. As the water vapor pressure increases, the capacitance increases. At time t = 0 in the circuit to the right, V_{in} changes instantaneously from -2.00 V to +2.00 V. Given that the resistance value of the resistor is 32.0 kΩ,



a) If the voltage between points E and F is +0.50 V at t = 0.100 s, calculate the capacitance of the transducer.
b) What would be the voltage between points D and E at t = 0.100 s?
c) What would be the voltage between points E and F at t = 0.42 s?

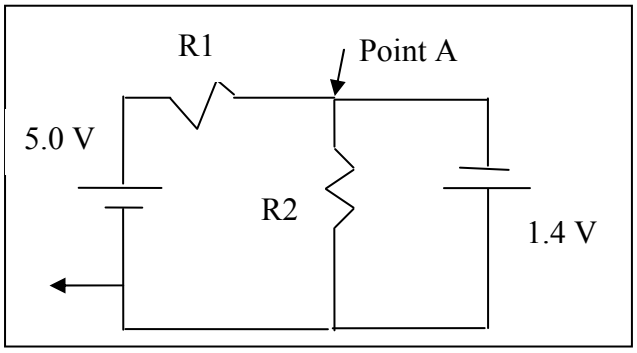
Additional Problems:

1. Given the following circuit to the right with R1 = 360 Ω and R2 = 140 Ω determine:

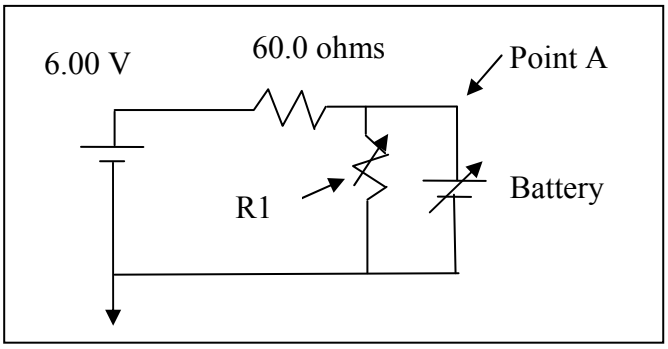
a) the current through each resistor.

b) the voltage at point A.

c) the power dissipated through R2.



2. The following circuit can be use to charge a battery.



The battery is initially at 1.71 V, but a fully charged battery should have a charge of 2.50 V.

a) Determine the initial Voltage at point A (note that this is independent of R1)

b) It is important not to allow too much current to the battery when charging (as this decreases battery lifetime). What resistance at R1 should be used to limit the current to the battery to 50 mA?

c) As the battery is charged and reaches 2.50 V, what is the new current (assuming R1 doesn't change)?

3. In the circuit to the right, at t = 0, V_{in} changes from -3.00 V to 0.00 V. R = 285 kΩ and C = 3.0 x 10^{-6} F.

a) What is the current (in μA) flowing from D and E at t = 0.40 s?

b) At what time will the voltage between E and F reach -1.00 V?