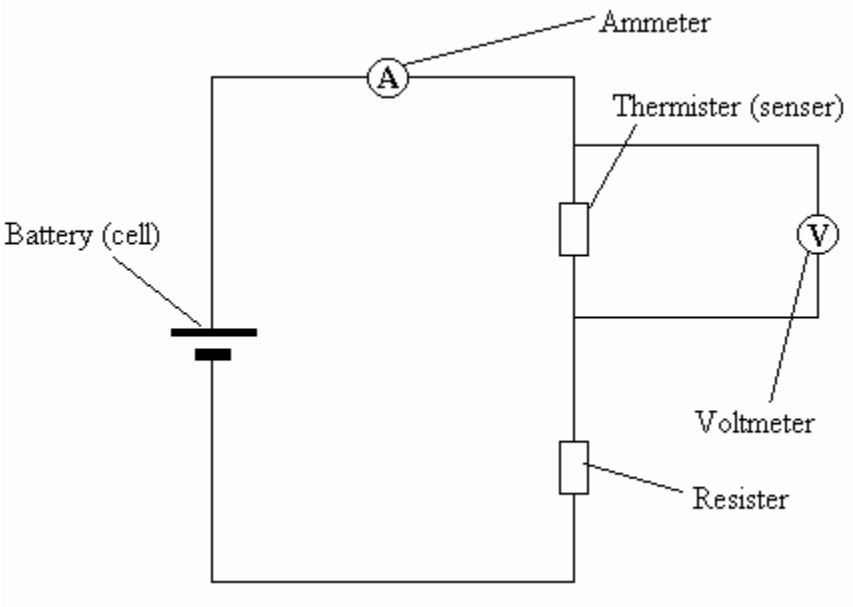
Physics Sensing Coursework

For my experiment I have chose to create a circuit that will test the temperature of a red wine bottle, to ensure that it is at room temperature, which it is best served at. For me to create this circuit, I will use a thermistor that measures temperature.

This sensor will give out different amp and volt readings depending on the temperature, therefore telling you the temperature the sensor is at.

I will arrange my circuit in the following way:



As you can see I have kept the circuit linear to ensure that it is as simple as possible. Two parallel wires will be ran off either side of the sensor in the circuit so that the voltage can be measured, and the current will be measured after leaving the cell.

The circuit works as a potential divider because of the resister. The resister changes the output voltage into a smaller fraction of the source voltage, so when it reaches the sensor, it is not as large.

(See tables and graphs for results)

From looking at my results on the graphs, it is clear to see that the results are curved and not linear. Generally speaking, the shape of the curves on each of the graphs is about the same. The anomalies for each of the graphs obviously obscure the curves, but they all appear to have a negative correlating curve. The resister with the greatest resolution is the 47k resister. This was the most accurate of the three, with the 2.7k having the worst resolution, and the 10k resister having a fairly competitive resolution, but not as good as that of the 47k resister. I had problems when it came to the sensitivity of each of the

resisters. The first set of results that I gathered was that of the 47k resister. This was very sensitive when it came to reading the amps, due many random fluctuations. The next experiment that I did was with the 10k resister, so I changed the ammeter's settings from 200m to 20m. This then meant that I only ended up getting 0.46 20m amps for all of the readings. If I had changed it back to 200m it would have been too hard to read, and my readings would therefore have been inaccurate as with the 47 k experiment. I needed a mid point between the two on the ammeter's readings. The 2.7 k resister was fine, as this was not very sensitive. The quickest resister in terms of response time was the 47 k resister. This responded quickest when I changed the temperature, but the slowest resister for response time was the 2.7 k resister. I had to regulate certain temperatures for a while with this resister while it changed its readings. I experienced significant random errors with each of my resisters. I tried my best to limit this by repeating my method the same way for each experiment, and also taking three readings for each temperature on each resister, in an attempt to even out this eventuality. Systematic errors are a lot harder than any other errors to detect in this experiment, as I would need better, more accurate equipment to measure if systematic errors had occurred. I obviously sis not have this equipment. Even though, a systematic error that probably arose with this experiment was varying room temperatures. Doing the experiments on different days and in a room without a regulator for the temperature meant that this could change the results I got by heating or cooling the liquid while I measured it. I tried to cut down other systematic errors by ensuring that I always used the same equipment. This meant that any errors due top equipment would be present in all my results, and be constant, therefore eliminating any interference with any trends of results.

In my opinion, the best potential divider for measuring the room temperature of a red wine bottle would be the 10 k resister. I came to this conclusion because it has an even balance of sensitivity, resolution and response time. Although the 47 k resister has a very good response time and resolution, it was too sensitive. If used in general manufacturing then it would tell a user varying readings all the time, and would be too confusing. The 2.7 k resister was not very sensitive and didn't have a good resolution. Again, in general manufacturing, it would leave a user waiting too long for a result, and would therefore be impractical. The main problem with the 10 k resister is that for reading the room temperature of a red wine bottle it is a bit too sensitive. It may fluctuate a bit, and therefore confuse a user. It wouldn't fluctuate as much as the 47 k resister, but users may still have problems. If I was to therefore to repeat this experiment, I would like to try a resister between 10 k and 2.7 k to try and lower the sensitivity to stop the fluctuations at the expense of response time and resolution.