Rubber Band Pre-Lab

Please answer the following questions before beginning the experiment. Think carefully before making your predictions, but don't worry if you aren't sure what will happen. In every case, give a reason for your prediction—guessing is perfectly acceptable, but if you are only guessing, just say so.

Tension vs. temperature Will the tension increase or decrease with increasing temperature? Sketch a graph of what you expect to observe. Be sure to include zero on the graph, and try to sketch the expected results to scale.

Isothermal stretch Pick a temperature and a range of lengths for which you (expect to) have clean data. [1]

1. If you stretch a rubber band, holding it fixed temperature, what will be the change in its internal energy? its entropy? Be quantitative and be explicit about whether they will increase or decrease.

2. What do you expect will be the sign of the work W? of the heat transfered Q? Explain what this means in terms of an actual observation (i.e. are you doing work or is the rubber band, and is it heating its environment or vice versa).

3. If the rubber band is reversibly isothermally stretched, what will the magnitude of W and Q be? Which is larger, and does this make sense to you? How do the magnitudes of W and Q compare with the magnitude of the change in internal energy?

by David Roundy

[1] I understand that you will probably have to guess on many of these. Use intuition where you can, and see if you can come up for a justification for reasonable values. The units of entropy are J/K, and all other quantities have dimensions of energy.