1 Name the Experiment 2

None Consider the following derivative:

$$\left(\frac{\partial V}{\partial S}\right)_T \tag{1}$$

Design an experiment to measure this derivative. In your answer, include a schematic of the aperatus and label the quantitites you would measure. Describe your measurement process, and show the algebra required to convert your directly measured quantities into the derivative.

2 Checking for Intensiveness / Extensiveness

For each of the following equations, check whether it could possibly make sense. You will need to check both dimensions and whether the quantities involved are intensive or extensive. For each equation, explain your reasoning.

You may assume that quantities with subscripts such as V_0 have the same dimensions and intensiveness/extensiveness as they would have without the subscripts.

(a)

$$p = \frac{N^2 k_B T}{V}$$

(b)

$$p = \frac{N k_B T}{V}$$

(c)

$$U = \frac{3}{2} k_B T$$

(d)

$$U = -N k_B T \ln \frac{V}{V_0}$$

(e)

$$S = -k_B \ln \frac{V}{V_0}$$

(f)

$$S = -k_B \ln \frac{V}{N}$$