B.1

You want to determine the gravitational constant using one of two different systems. Both systems involve dropping a mass initially at rest over a certain distance (s), measuring the time to cover that distance (t), and then calculating g with the equation $g = 2s/t^2$. The first system is a device of 78.64 ± 0.050 cm which has a timer accurate to 0.30 ms. The second system involves throwing the mass over a 96.20 ± 0.20 m cliff, and measuring time accurate to 5 ms. Using the value 9.81 m/s^2 as the anticipated value for g, which of these two approaches would provide the best way to determine the value for g?

B.2

You want to estimate the molecular weight of a gas using the ideal gas law. For this purpose, the you modify the ideal gas law to be:

$$\text{M.W.} = \frac{mRT}{PV}$$

You use a special container having a volume of 2.241 ± 0.006 L, and empty (evacuated) mass of 64.345 ± 0.007 g. You place the gas sample in this container at a pressure of 1.354 ± 0.008 atm and temperature of 299.5 ± 0.2 K, and determine the mass to be 82.452 ± 0.008 g. What is the molecular weight of the unknown gas? Assume that the universal gas constant has no “error”. Which measurement contributes the most to the error in the final calculation of molecular weight?

B.3

The following data were obtained for the analysis of glucose solutions by HPLC using a refractive Index detector. What concentration would you be comfortable in quantifying with this analytical technique?

Glucose mg/L	Areas
7.8	534
7.8	675
7.8	359
7.8	612
15.6	1320
15.6	980
15.6	1081
15.6	1073
31.3	2319
31.3	2285
31.3	2143
31.3	2051
62.5	4275
62.5	4211
62.5	4269
62.5	4277
125.0	8174
125.0	8219
125.0	8381
125.0	8200
250.0	16453
250.0	16405
250.0	16703
250.0	16403