1. In a set of laboratory instructions for an experiment you are doing, you find that you have to make three measurements: a measurement of weight where the target value is 3.6 grams, a measurement of volume: target value is 75 mL, and a measurement of length: target value 15.5 cm. You have available 3 pieces of equipment with which to make the measurements: a balance, whose absolute uncertainty is ±0.1 g, a graduated cylinder, whose absolute uncertainty is ±2 mL, and a ruler, whose absolute uncertainty is ±0.2 cm.

a) Which measurement will be the poorest measurement?  SHOW HOW you come to this decision.

b) If the experiment you are carrying out needs to be done to a quality of no worse than 2.5% will the instruments you use be good enough to do the job?  SHOW HOW you come to this decision.

2. Your Aunt Sadie has left you in charge of her favorite plant, Audra. She left instructions that you faithfully give Audra 5.0 mL of a Fancy Food Supplement, so as to keep Audra’s leaves bright and shiny. You want to keep your Aunt Sadie happy (She’s the rich one in the family) so you go and obtain a 5.00 - mL pipet from a Kindly Old Professor. But you know the weaknesses and deficiencies of the KOP, so you decide to make sure that the you are actually delivering 5.0 mL using this pipet. You do this by the proper method of calibration: you fill the pipet to the 5.0 mL mark with pure water. You pour out the water and weigh it, and from the density you can calculate the true amount of water actually delivered. You decide to do this 7 times (for luck). Your measurement values are (in mL):

4.1, 5.2, 4.7, 5.2, 4.8, 5.1, and 5.0

A – Is Gross Error present in these measurements?  ____________________________
SHOW HOW you arrive at your answer?
B – What is your decision as to what value of mL the pipet is actually delivering? _____
SHOW HOW you arrive at your answer?

C – With 95% confidence what is the effect of random error, expressed in mL, _______
on these set of measurements?  SHOW HOW you arrive at your answer.

D – Again with 95% confidence, is the pipet delivering the desired volume __________
of Fancy Food Supplement?  EXPLAIN YOUR REASONING

3. In the Statistics Worksheet Exercise one issue that arose was the distinction between a
Real Effect and a Systematic Error.
a) How are these two things the same?  Be clear and concise in your answer.

b) How are these two things different?  Be clear and concise in your answer.

c) In question 2 above, are you dealing with a Real Effect issue or a Systematic Error
issue?  Explain your reasoning.  Is either of these present in question 2?  Explain

I have neither given nor received any unacknowledged aid on this quiz.
SIGNED ________________________________________________