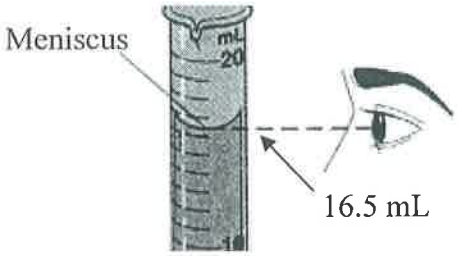
Chemistry
Measurement Lab

Name _____
Period _____ Date _____

Summarize the purpose of this lab in your notebook:
In this lab you will investigate the accuracy and precision of measurements. Your group will be measuring 25 mL of water using three different pieces of equipment: a beaker, a 100mL graduated cylinder and a 25 mL graduated cylinder. You will be checking to see how good a job of measuring you did by weighing the samples on a triple beam balance and taking advantage of the fact that at room temperature 1.00 mL of water has a mass of 1.00 g—that is, for water— mL=g.

Techniques:

Measuring volume: A volume of water (or a solution made with water) is always measured from the bottom of the meniscus. The meniscus is a curve in the level of liquid. See the illustration at the right. Always look at the meniscus at eye level. Be sure you know where the zero level is on the equipment you are using. For beakers and graduated cylinders, zero is at the bottom.



Measuring mass: You will be using a triple beam balance to measure mass. Be sure to zero the balance before making a measurement. Zeroing is done by ensuring that the scale reads zero prior to adding mass. Never spill anything on the balance pan and keep the balance clean at all times. When making multiple measurements of mass, you should always use the same balance to eliminate any differences between two balances.

Procedure:

1. In all, 9 measurements will need to be taken: 3 each using a beaker, a 100 mL graduated cylinder, and a 25 mL graduated cylinder. Figure out who is doing what. Each member must do at least 1 measurement; some of you will need to do 2 measurements. The person(s) doing 2 measurements should do them with different types of equipment. Record the initials of the person doing the measurement on the table on the back of this sheet.

2. Take a look at each piece of equipment. For each piece of equipment, decide to how accurately you think you can measure 25 mL. Can you tell the difference between 25 and 26 mL? How about 25.0 and 25.1 mL? **Record what your group thinks in your lab notebook. (Beaker? 100mL graduate? 25 mL graduate?)**

3. Each student should select an empty container. Make sure it is dry, and record its mass to the nearest centigram (two decimal places) on the digital balance. Do not exchange cups with another student. Use the same cup and balance throughout this experiment. **Record the Mass of the Empty Cup in your composition/lab book.**

4. Measure 25 mL of water as accurately as possible into your cup using either the beaker, graduated cylinder, or buret. Record the mass of your cup and water on the same digital balance that was used to measure the mass of the empty cup. Dump the water in the sink, dry your cup, and repeat. **COPY the table below in your lab book record your data:**

Mass of cup and water using (circle one):
beaker, 100 mL graduate, 25 mL graduate: 168.59 g; mass of water 18.11

Mass of cup and water using (circle one):
beaker, 100 mL graduate, 25 mL graduate: 103.4 g; mass of water 24.1

Mass of cup and water using (circle one):
beaker, 100 mL graduate, 25 mL graduate: 50.4 g; mass of water 23.3

5. Exchanging data with other students at your table, **COPY THIS TABLE AND COMPLETE IT IN YOUR LAB BOOK**:

Mass of 25 mL of Water

Measuring with: Beaker		100mL Graduate		25mL Graduate	
Mass of H_2O	Initials	Mass	Initials	Mass	Initials
19.61		24.7		23.2	
21.71		23.3		23.2	
13.01		24.3		23.5	

Calculations and Analysis:

1. **Copy** and complete the table in your lab book. The range is the largest number minus the smallest number.

Measured Using	Average Mass of H_2O	Range
Beaker	18.11	8.7 mL
100 mL Graduate	24.1	1.4 mL
25 mL Graduate	23.3	0.3 mL

Post Lab Questions (COMPLETE IN LAB BOOK)

2. Which equipment to measure volume was the most accurate in this lab (remember that accuracy is how close the measurement is to the desired target)? Explain your answer.
3. Which equipment was the most precise (remember, precision is how close a series of measurement are to each other)? Explain your answer.
4. Compare your results with the analysis accuracy for each piece of equipment you made at the beginning of this lab. How comparable are your results with your accuracy for each device?

1. Most accurate?

100 mL was most accurate ie → closest to 25 mL/g

2. Most precise?

25 mL was more precise → smallest range

3. compare/contrast

Predict: 25mL > 100mL > beaker

Actual: 100mL > 25mL > beaker