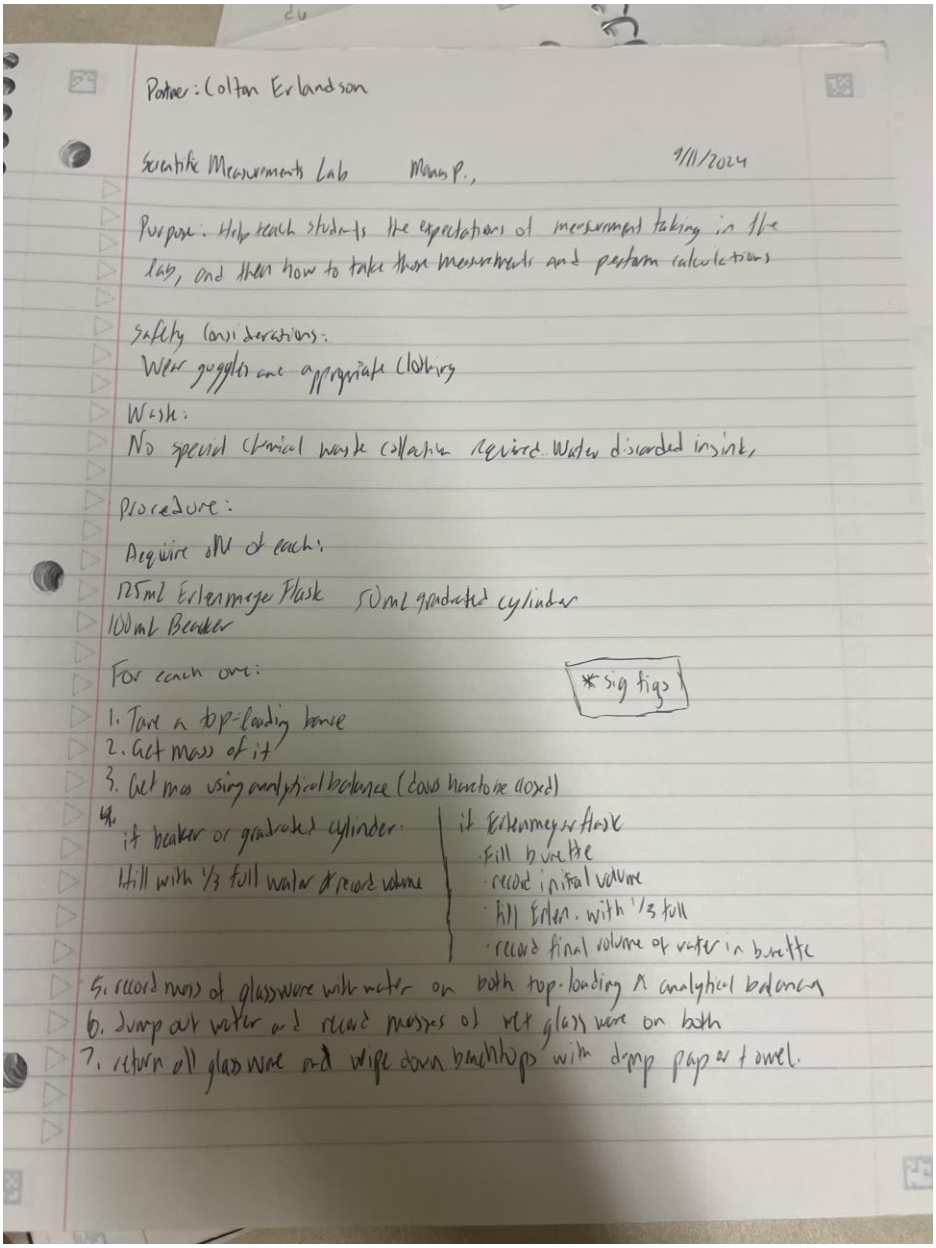
1. In 1-3 complete sentences, describe the difference between measurement **accuracy** and **precision** in the context of scientific laboratory measurements.
   Accuracy refers to how close a measured value is to the true or accepted value. For example, if the accepted value for gravity is 9.81 m/s^2, recording a value of 9.8 is relatively very accurate. Precision mainly refers to how consistently a measurement is repeated in the same conditions. Using the same example, if we did three recordings, and got 9.8 three times in a row, we would have very high precision. In a scientific laboratory, high accuracy leads to correct results, and high precision leads to consistent results.

2. A student has access to a **top-loading balance** (0.01 g precision) and an **analytical balance** (0.1 mg precision) in lab. Both balances were calibrated before use, and the student was appropriately careful with their measuring technique when using each balance. The student uses the top-loading balance to measure the mass of a bulky solid sample and reports a measured mass of **50.56 g**. They then carefully transfer the entire sample to an **analytical balance**. However, the sample size prevents the doors from closing around the analytical balance. Nonetheless, the analytical balance reports a measured mass of **50.8145 g**, and the last digits fluctuates up and down. In 1-4 complete sentences, compare and contrast both the accuracy and precision of the two types of balances under the described scenario.

In this scenario, the top-loading has a lower precision (.01g < .1mg), but we can see that it's designed for larger samples and is able to provide us a consistent value of 50.56. That is reliable and stable reading, with high accuracy. The analytical balance though, since we cannot close the doors, will be inaccurate. Even though it has a much higher precision, and it will always report very similar values, its accuracy is compromised by the conditions of the experiment. In conclusion, the analytical balance is more precise, but less accurate than the top-loading balance due to the inability to properly take sample readings.

3. Suppose you use a calibrated analytical balance (0.1 mg precision) to carefully weigh out a sample of chemicals (with no spills) and observe a mass of 2.1427 g. You then close the doors of the balance and briefly wait for the mass to stabilize. The last digit fluctuates up and down (e.g., 2.142**6** g, 2.142**7** g, 2.142**8** g, 2.142**6** g, etc.). In 1-3 sentences, explain how you should interpret this fluctuation in the reported mass.
   The fluctuation in that last digit of mass is a general occurrence due to the high sensitivity of the analytical balance. In labs, when we're measuring masses, the analytical balance will often fluctuate in those last digits. It's generally from minor uncontrollable practical factors such as either air currents, vibrations, or pressure being put on the table that messed with the balance. Ideally, you should interpret this as a stable and reliable reading of the mass from the balance and report it as 2.1427g (±.1mg).

Attach ALL your lab notebook pages below, and tag accordingly.



Partner: Colton Erlandson

Scientific Measurements Lab Mass P., 9/11/2024

Purpose: Help teach students the expectations of measurement taking in the lab, and then how to take those measurements and perform calculations

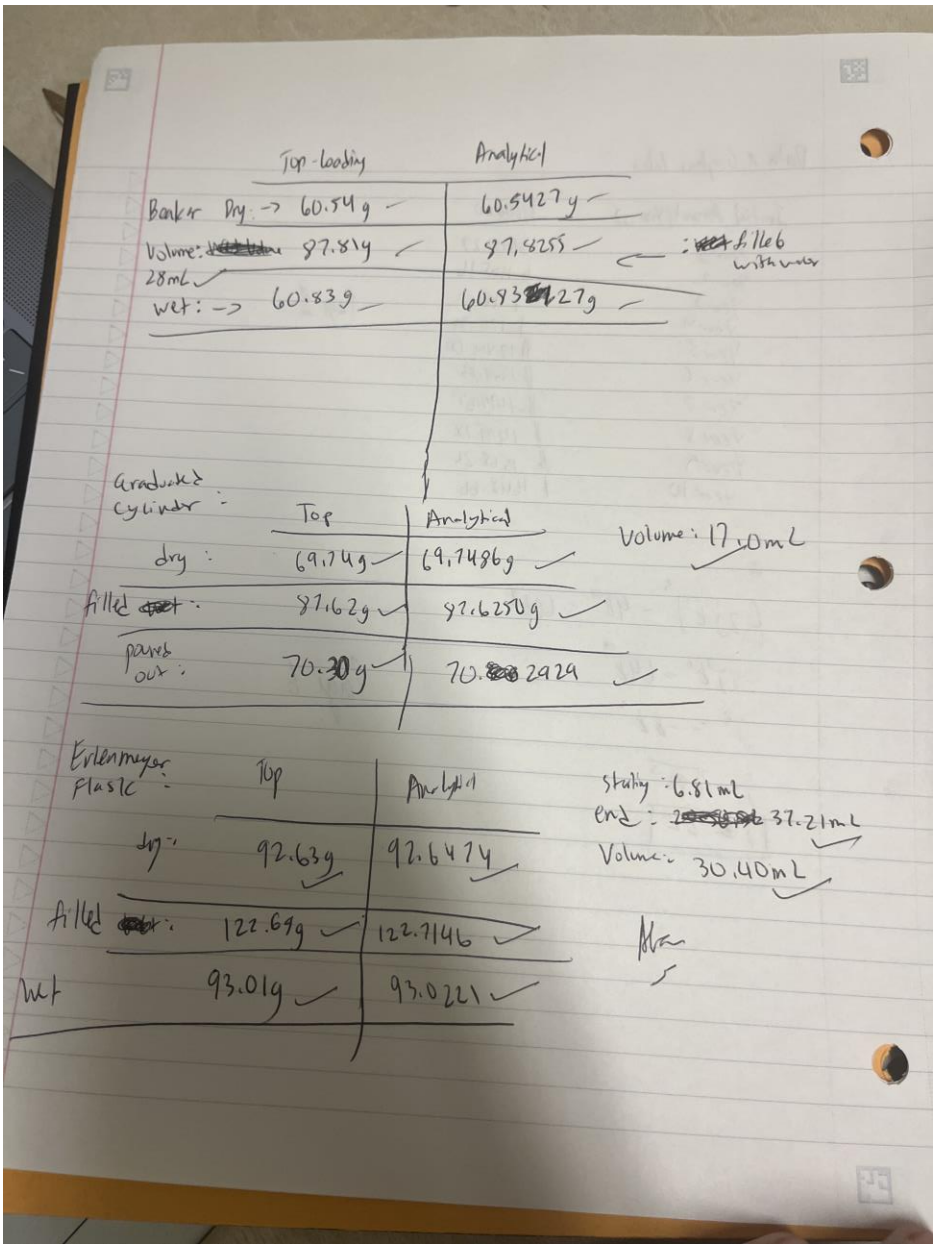
Safety Considerations:
Wear goggles and appropriate clothing

Waste:
No special chemical waste collection required. Water discarded in sink.

Procedure:
Acquire all of each:
125mL Erlenmeyer Flask 50mL graduated cylinder
100mL Beaker

For each one: *sig figs

1. Tare a top-loading balance
2. Get mass of it
3. Get mass using analytical balance (close balance doors)
4. if beaker or graduated cylinder: fill with 1/3 full water & record volume
   if Erlenmeyer flask:
   - Fill burette
   - record initial volume
   - fill Erlen. with 1/3 full
   - record final volume of water in burette
5. record mass of glassware with water on both top-loading & analytical balances
6. Dump out water and record masses of wet glassware on both
7. return all glassware and wipe down benchtops with damp paper towel.



	Top-loading	Analytical
Beaker Dry: →	60.54 g	60.5427 g
Volume: ~~[illegible]~~ 28mL	87.814	87.8255 ← ~~fille~~ filled with water
wet: →	60.839	60.83~~9~~27 g

Graduated Cylinder:	Top	Analytical
dry:	69.74 g	69.7486 g
filled ~~[illegible]~~:	87.62 g	87.6250 g
poured out:	70.30 g	70.~~30~~2929

Volume: 17.0mL

Erlenmeyer Flask:	Top	Analytical
dry:	92.63 g	92.6474
filled ~~[illegible]~~:	122.69 g	122.7146
wet	93.01 g	93.0221

starting: 6.81mL
end: ~~[illegible]~~ 37.21mL
Volume: 30.40mL