Objective:
Derive a lab write up that outlines and explains the nature of a lab experiment. You are investigating the accuracy and precision of measurements using volumetric instrumentation.

Outline:
The lab write up will have to include the following sections: Introduction, Materials/Methods, Data, Results, & Discussion.

- An **introduction** includes a title, names, course, & date. It also is a short description of the topic, written from most general to most specific. It must also include the research objective/hypothesis. This needs to outline exactly what it is that you are testing.
- The **materials/methods** section has two parts: first, it is a listing/description of the materials you used in the lab. It doesn't have to list all the equipment unless it is something that is unique to this experiment, secondly it outlines the procedure you went through to obtain your data. Be sure to identify your variables, both experimental and controlled. The idea of replication in science is significant and this section is how you lead someone through your work
- **Data** is exactly that… the data that you took from your lab. It can also include observations but these HAVE TO BE non-biased. Data CAN NOT be interpretive. This is typically organized into a table so that you can show the actual values obtained in the work.
- The **results** section is a description of the data. You need to represent your data in a way that makes a point. Graphs, tables, charts, calculations, and descriptions are included here. This section is also non-biased. You CAN NOT interpret the results.
- The **discussion** is really a conclusion. It is here where you address your objective/hypothesis as being valid or false. We can never "prove" anything but we can support a hypothesis. This section allows you to interpret your results and explain what you think is happening. It is written from most specific to most general. You will also want to write into the discussion causes of error, changes to the lab procedure and other possible research that would further your understanding of a science concept.

Hints for Lab:
To assess accuracy of an instrument you will need to be able to record the uncertain measure (obtained by the volume of water in the instrument) and a certain measure (obtained by massing the water and then calculating actual volume from density). Your group will have to decide the volume you plan to measure
The assessment then will need to include a percent error. If accuracy is how close you are from the actual, then error is how far you are away. Percent error then assesses how the error compares to the actual.
Precision can be assessed by analyzing the consistency of the instrument. You will need to calculate a standard deviation for each instrument. The standard deviation is an indicator of variance within a set of data. If a set of measures are precise, how will the percent errors compare?
Data has to be organized. USE TABLES. If the data is organized then it is much easier to interpret what the data means and reduce the chances of human errors.
Remember that you will have to correctly read the volume from each instrument. All instruments have an intrinsic accuracy based on the way it is calibrated. Readings include all possible certain digits and then one uncertain digit (guess).

Equipment:
You will be given 5 instruments in which you will assess accuracy and precision: Erlenmeyer Flask, Pipet, Buret, Beaker and Graduated Cylinder. It is accepted practice that for significance of measure you should have no less than 3 replicates.