How is lab equipment used report example

Technology, Development

Introduction

Accurate and precise measurements are of uttermost importance to chemists everywhere. A measurement is said to be accurate when it is very close to the accepted value. A precise measurement is one in which repeated measures yields values or figures that are very close to one another. However, not all measuring instruments have an equal ability to give accurate and precise measurements. In any given experiment, the techniques and the equipment used to collect data should essentially be of the same precision. In the course of an experiment, there are bound to be less precise measurements and it these measurements that determine the overall precision of the entire experiment. In a laboratory for example, there are various volume measuring equipment whose precision and accuracy varies. In order to correctly determine the precision and accuracy of these instruments, their measurements should be compared with those of another measuring instrument, for example, an electronic balance.

Procedure

- A 50 ml flask with stopper was weighed on an analytical balance. Using a graduated cylinder, 25 ml of water was measured and poured into the flask and the flask reweighed with the new contents.
- The water was then emptied form the flask and the procedure repeated two times with the graduated cylinder.
- The above procedure was then repeated only that in this case, the graduated cylinder was replaced with a pipette, a burette and a beaker with three measurements being conducted for every instrument.

- The results from each of the instrument were recorded and compared with each other

- The average percentage error was calculated for each of the volumetric equipment used using the following formula

Percent error= difference between measured value and accepted value/ accepted value X 100%

Discussion

- Purpose of the experiment

The purpose of this experiment was to develop a suitable procedure for the determination of precision and accuracy of various volume measuring equipment.

- Precision and accuracy

The volume measuring equipment used in this experiment included volumetric beakers (100ml and 250 ml), flasks, graduated cylinders, pipettes and burettes. An electronic measuring balance was also used to develop a relationship between mass and the volume of the materials being measured. Being the only trusted equipment in this experiment, the purpose of the electronic balance was to enable the calculation of density (a known characteristic of the materials) and thus determine the precision and accuracy of that material. An analysis of the various observations made revealed several things.

- A burette is significantly more accurate and precise than the pipette, the beakers, and the graduated cylinders.

- A burette is more highly calibrated than the pipette, the beakers and the graduated cylinder. It will therefore measure the volume of any given

material (in this case water) to more significant figures than the other two volume measuring devices.

- A graduated cylinder is more accurate and precise than the beakers and flasks.

- Beakers do not generally have enough lines of calibration to make them effective volume measuring equipment. They are generally used for mixing and holding substances or for qualitative lab activities rather than quantitative activities.

- Significant figures

Accuracy and precision are two of the most important concepts in chemistry. However, the equipment used in the laboratory is limited in that they can only report certain amounts of data only. For instance, certain volume measuring equipment in the lab can only measure until a specific decimal place. This is because there is no one single equipment that can measure an infinite number of digits. Lab equipment can only measure up to a certain number of digits precisely. These numbers that can be determined precisely are the significant digits. An instrument with the ability to measure a higher number of significant figures is more precise and accurate.

4. Errors

The main types of errors in this particular experiment were systematic and random errors. The systematic errors emanated from faulty reading of the lab instruments. For instance, the reading of a particular instrument from an angle gave rise to faulty readings. Random errors in this experiment mainly emanated from involuntary adjustments variation of the lab conditions. It was these errors that led to the errors inconsistencies in volume

measurements. Consequently, the inconsistencies led to the observed errors in densities because density is directly related to volume and mass. The variations in volume can also be attributed to the differences in calibration of the various measuring equipment which affected the precision of the entire endeavor. To improve this experiment in the future, steps should be taken to reduce the occurrence of random and systematic errors. Random errors can be significantly reduced by making repeated measurements or by refining the method or technique of measuring. Refining the method or technique of measuring can also help to reduce the systematic errors. In addition, the experiment should be conducted in an environment that has relatively stable environmental conditions.

Conclusion

As seen from the above experiments, no measurement made in the lab using the common measuring equipment can be accurate. Errors may result from equipment limitations or from human error. In the case of volumetric measurements, the burette is more precise than the other instruments because it is more calibrated.